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Fig. 1—Two oil-fired furnaces and a gas-fired rotary with dumping baskets "agitated" by a crank.

Proper furnaces, built with heavy walls to retain heat, are essential to economical heat-treating work in large or small shops. Cleanliness and good housekeeping are also factors considered in the shop described in this article

By Fred H. Colvin
Editor, American Machinist

Accurate Heat-Treating in the Small Shop

AMONG the requirements for successful heat-treating in the small shop are furnaces that can be depended upon to give the desired temperatures at all times and provision for quenching the material in the right baths at the right temperature. Furthermore, everything should be kept scrupulously clean in the hardening room for best results. This cleanliness should extend to the work, to the oil and water used for quenching, and to the furnaces and the building. White tile walls, and cleanliness on the part of the operators are not frills, but help to keep the product up to its proper standard.

With the man in charge thoroughly familiar with modern practices the furnace must receive careful attention as in the case of The William Schollhorn Company of New Haven, Conn., where the large furnace at the left in Fig. 1 was built to the design of the company. It has extra heavy walls 18 in. in thickness and has flues that run the whole length of the furnace. These flues have dampers by which the flow of heat can be directed

to any part of the furnace so as to secure an even temperature. This furnace is oil fired, as is also the one at the right. The rotary furnace is gas fired.

In front of the rotary furnace is an agitator, or "jiggler" in shop parlance. This consists of a wire basket suspended from a crank that raises and lowers it through a six-inch stroke. The contents of the rotary furnace can be dumped easily into this wire basket, the work being automatically raised and lowered in the oil bath until cool. Motion for this raising and lowering is obtained by a crankshaft supported on overhead beams. Details of the bell-crank connections are seen in Fig. 2. These connections do not interfere with the operation of the hoist, as can be seen in Fig. 1, where it is hooked to the rotary furnace. A trolley hoist enables the wire baskets to be removed easily and to be replaced with another at will.

Near the large furnace are the salt baths in which saltpeter (potassium nitrate) is used. These are used for treating pliers and similar tools made by the company, the heat running from 1,300 to 1,400 deg. F. The method of handling the pliers is of interest. The parts are strung on wires as shown in Fig. 3. This method suspends all parts in the same position for heating and quenching.

The equipment for handling the high-speed and other tool hardening is seen in Fig. 4. These are gas-fired furnaces, and have the quenching tanks in front. This makes it easy to get the work from the furnace to the tank without loss of time.

Some of the tools are made of alloy steels such as S.A.E. No. 5120. These are carburized at from 1,550

Fig. 2—Stringing plier jaws on wire to insure all being heated and quenched in the same position

to 1,650 deg. F., depending on the nature of the work. The temperature desired is held within a total tolerance of 20 deg. F. Some of the work is quenched directly from the rotary furnace seen in Fig. 1, while other carburized work is permitted to cool in the pots.

A typical treatment for the cutting pliers after carburizing and using steel similar to that previously mentioned is to treat the core first by heating to 1,590 deg. F. and quenching in cold oil. The case is then refined by

Fig. 3—High-speed hardening equipment with tanks for quenching

heating to 1,390 or 1,440 deg. F., depending on the size of the work. The average work is heated from 1,390 to 1,410 deg. Fahrenheit.

The tools are then drawn in oil by heating to from 300 to 375 deg. F. for cutting edges and to 800 or 900 deg. F. for the softer parts. This treatment has proved very satisfactory for such work as cutting pliers, which require hard cutting edges, supported by a soft, tough core that insures strength and durability.

Keeping Parts Readily Accessible

By Fred H. Colvin

STORING parts before assembling so that they will be safe, free from injury, and easily accessible for the next operation, is not always easy. Boxes, bins, barrels, and other means have been tried with more or less success. The William Schollhorn Company, New Haven, Conn., finds that both barrels and boxes are useful in its work, which consists largely of making pliers and small tools. Steel barrels are convenient for many of the parts, such as handles, both for component parts, as at the left in the illustration, and for sub-assemblies, as at the right. These barrels are easily handled by trucks to the proper department when they are needed.

Using steel barrels and boxes for storage

Tote boxes for smaller parts are also found useful, and are easily stocked and handled. The main object of the illustration, however, is to show the orderly manner which both the barrels and boxes are kept.

Accounting for Depreciation *in a Period of Falling Prices*

By Thomas B. Frank
Treasurer, The Cincinnati Planer Company

Replacement value and not original cost should be the basis for calculation—the author tells why

CONSIDERABLE discussion has centered around the question of computing depreciation allowances upon replacement or current value of plant facilities and equipment. Articles on this topic have appeared in the *American Machinist*, Vol. 69, pages 789 and 997, and Vol. 70, page 619. The establishment of values on buildings and equipment has been based generally on an increasing price trend, and the corresponding depreciation has been calculated on figures that were higher than the original cost. This procedure is fundamentally sound, considering that a large percentage of the industrial plants of the country were built and equipped during the period before the war, when prices and values were consistently lower than they are now, or have been at any time since.

The object in including a depreciation charge in the cost of production is to provide for the setting aside of an amount sufficient to build up an allowance, or reserve, to take care of the ultimate replacement of the property when the replacement period arrives. If prices on equipment drop, the current value of the property, or the corresponding cost required to replace it, becomes less. Therefore it seems advisable to charge the cost of production with a depreciation charge computed on the present value. There is no purpose in burdening current costs with an amount of depreciation based on a cost of acquisition that is excessive when present-day values are considered.

Income tax regulations permit inventories of raw materials, work-in-process, and finished merchandise in stock to be valued at cost or market price, whichever is lower. Should not the plant properties be considered in a similar manner, especially when they are charged off over a period of several years?

The proposal has been advanced that plant properties should be valued, for depreciation purposes, at cost or market price, whichever is higher. This procedure is certainly fallacious, since the intent and purpose of depreciation is to provide for the ultimate replacement of the property when it is worn out, obsolete, or otherwise useless. Why burden costs with an amount in excess of that necessary to provide for the current value of equipment, which is replacement value until another current value is established to take its place? It certainly is not the cost of acquisition that must be recovered if the business is to continue, but the current replacement value, which may be greater or less than the original cost. If a machine cost $5,000 in 1920 and today sells for $3,000, no one would be foolish enough to go out in the market and pay $5,000 for it.

The argument may be advanced that a larger reserve would be set aside if depreciation were charged out on the old cost values, thereby enabling the firm to buy more machines, or better machines. Or, in the example cited, the purchase of a new machine would leave a cash margin of $2,000 that could be held against other contingencies. This possibility is unquestionably true, but the important

Schedule 1—Calculation of Depreciation

	Cost of Acquisition	Current Replacement Values	Decrease	Rate of Depreciation, Per Cent	Depreciation: On Cost of Acquisition	Depreciation: On Current Replacement Values	Depreciation: On Decrease	Allowed for Income Tax Purposes: Rate, Per Cent	Allowed for Income Tax Purposes: Amount
Real estate	$10,000.00	$12,000.00	*$2,000.00*[1]	...	...	...	...	..	...
Buildings	152,000.00	140,000.00	12,000.00	3½	$5,320.00	$4,900.00	$420.00	2	$3,040.00
Machinery	245,372.75	190,000.00	55,372.75	10	24,537.27	19,000.00	5,537.27	6	14,722.37
Shop equipment	75,000.00	50,000.00	25,000.00	20	15,000.00	10,000.00	5,000.00	15	11,250.00
Power house	20,000.00	17,000.00	3,000.00	10	2,000.00	1,700.00	300.00	8	1,600.00
Office furniture and fixtures	3,000.00	2,200.00	800.00	15	450.00	330.00	120.00	10	300.00
Totals	$505,372.75	$411,200.00	$94,172.75	...	$47,307.27	$35,930.00	$11,377.27	..	$30 912.37

Depreciation on current replacement values	$35,930.00
Depreciation allowed for income tax purposes	30,912.37
Amount disallowed to be shown on reconcilement schedule of tax return	$5,017.63

[1]Increase.

Schedule 2—Procedure in Recording Depreciation

Entry No. 1.

Debit: Cost of Production	$35,930.00	
Debit: Equipment Replacement Reserve	11,377.27	
Credit: Equipment Replacement Reserve		$47,307.27

To record depreciation, charging the cost of production with the depreciation on current replacement values and setting up depreciation on a cost basis, charging back the depreciation on the decreased valuation.

Entry No. 2.

Debit: Reserve for Replacement Value Decrease	$94,172.75	
Credit: Plant and Equipment Accounts		$94,172.75

To record the reduction in values of plant and equipment.

matter of the selling price of the company's product must not be overlooked. Competitive selling prices must be based on costs that include depreciation calculated on current values.

If the selling prices are calculated on costs in which the depreciation allowance is based on the original cost of the equipment, the margin of price increase may be sufficient to lose business for the company. Loss of business resulting from too high a rate is far more important to consider than the possibility of creating an oversufficient reserve by continuing to charge depreciation on cost of acquisition, when current values are much lower.

The theory is very simple, inasmuch as it is the direct opposite of the theory applied to increased valuations. In any increasing price cycle we must account for the increased valuation consumed in plant operations. The methods to be followed in a cycle of decreased valuations are the same.

Let us assume that a plant has been built and equipped during the peak of prices, the total cost of acquisition being $505,372.75. Suppose that an appraisal of the property now shows a value of only $411,200. In other words the replacement, or current, value of that property is now only $411,200. There has been a shrinkage of $94,172.75 in total value.

In the first column of Schedule 1, herewith, are shown the costs of acquisition of this industrial plant, in the second column, the current replacement values, and in the next, the decrease in values.

In the next columns are shown the depreciation rates, and the depreciation computed, at those rates, on the cost of acquisition, amounting to a total of $47,307.27. The fifth column shows the amount of depreciation, $35,930, that would be computed on the current replacement value, which is less than the cost of acquisition. The next column shows the amount of depreciation that is applied to the decrease in value of the plant properties. The last two columns list the depreciation rates and amounts that must be reported on the income tax returns, when the tax regulations do not permit the use of rates that are consistent for internal cost and management purposes of the assumed organization.

Schedule 3—Ledger Account

Equipment Replacement Reserve

	Debits	Credits	Balance
Depreciation on cost		$47,307.27	$47,307.27
Depreciation on decrease in valuation	$11,377.27		35,930.00

The balances are credit balances.

This data is shown to illustrate the handling of the difference between the depreciation allowance to be used for the company's own purposes, and that allowed the same company as a deduction in making returns of income for tax purposes. The income tax unit in many

Schedule 4—Balance Sheet

ASSETS			
Current			
Cash	$44,300.00		
Notes and Accounts Receivable	162,225.00	$206,525.00	
Inventories			
Raw Materials, Process and Finished Goods		300,250.00	$506,775.00
Other Assets			
Investments, etc.			200,000.00
Deferred			
Prepaid and Prorated Expenses			12,460.25
Plant and Equipment—Cost Values			
Real Estate—Land Only		$10,000.00	
Depreciable Equipment:			
Buildings	$152,000.00		
Machinery	245,372.75		
Shop Equipment	75,000.00		
Power House Equipment	20,000.00		
Office Furniture and Fixtures	3,000.00	495,372.75	
		$505,372.75	
Decrease from Cost to Current Replacement Values		94,172.75	
Current Replacement Values			411,200.00
			$1,130,435.25
LIABILITIES			
Current			
Notes Payable	$50,000.00		
Accounts Payable	40,000.00	$90,000.00	
Fixed			
Mortgage Bonds		100,000.00	$190,000.00
Reserves			
Equipment Replacement Reserve—Cost	$272,144.44		
Less: Amount of Depreciation of Decreased Valuation	37,024.32		235,120.12
Net Worth			$425,120.12
Capital Stock			
Preferred	$200,000.00		
Common	300,000.00	$500,000.00	
Surplus			
Earned Surplus	$267,380.80		
Less: Reserve for Replacement Value Decrease	94,172.75	173,208.05	
Undivided Profits		32,107.08	705,315.13
			$1,130,435.25

cases has not permitted the use of depreciation rates as high as the rates determined by the machine tool industry as consistent and practicable for that industry. This difference must be shown upon the tax returns, and reconciled with the surplus accounts in the space provided for the purpose.

As we have indicated, the correct depreciation to enter upon the accounts and charge to cost of production is the depreciation based upon the current replacement values. In the example shown, the amount of $35,930 would be entered as the annual charge to costs, and the offsetting credit to the Equipment Replacement Reserve.

An entry similar to the one shown on Schedule 2, Entry 1, would then be made on the accounting records. This entry charges, or debits, the Cost of Production with the depreciation on the current replacement value only, amounting to $35,930. It credits the Equipment Replacement Reserve with the total depreciation based on the cost of acquisition, amounting to $47,307.27. It also charges, or debits, the same Equipment Replacement Reserve with the depreciation computed on the decrease in value, amounting to $11,377.27. An entry of this sort records the depreciation amount computed both on the basis of cost of acquisition and on the current replacement value. It sets up in the reserve account the amount computed on the original cost, and offsets that amount with the amount of depreciation computed on the decrease in value.

This method gives the management the information on both cost and value bases, recorded in the same account and always presented at the same time. Although the procedure is followed as a matter of simplification, it has the advantage of keeping all depreciation records together, so that one will not be considered without the other. They may be transferred to separate accounts if desirable, and the combined figures shown on the balance sheet. Such a depreciation account is presented on Schedule 3. The balance of the reserve account will at all times reflect the net amount of depreciation, which will be the amount desired, that based on current replacement values.

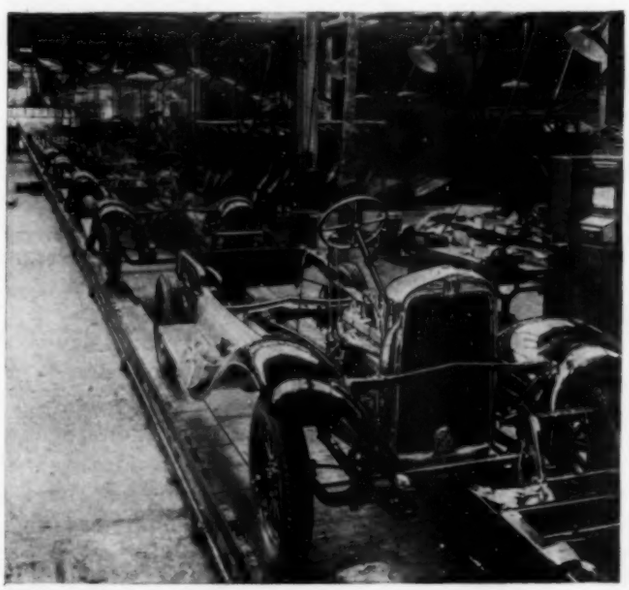
Entry No. 2 on Schedule 2 sets forth the information necessary to enter upon the accounting records the amount of the decrease in valuation of plant and equipment. This entry is self-explanatory.

After the correct entries have been made their effect will, of course, be reflected upon the financial statement, or balance sheet. A hypothetical balance sheet is shown on Schedule 4, with the various accounts and classifications affected by values and depreciation shown in boldface type. A balance sheet statement of this sort gives the executive at a glance the cost value of his plant and equipment, together with the amount of the shrinkage in value, and the current replacement value of the properties. It also shows him the Equipment Replacement Reserve based on cost of acquisition, from which is deducted the amount of depreciation on the decreased values, the net result applying only to the Current Replacement Values, as shown above on the asset side of the balance sheet statement.

The effect on the Surplus account is shown in like manner. The Earned Surplus of the business is shown as $267,380.80, from which is deducted the amount of the Reserve for Replacement Value Decrease of $94,172.75, leaving a net Surplus available for distribution of $173,208.05. The balance sheet statement shows all of the facts. If the statement omitted any of this information, intelligent decisions could not be made, because the picture would not be complete. As E. F. DuBrul has stated in a previous article, it is just as important to show "both costs and actual values for all assets in times of rising prices, as well as in those times when prices fall."

Three Models on One Assembly Line

SEPARATE assembling lines for each model of automobile were formerly considered necessary, but the endeavor to concentrate plant activities in as small a space as possible has caused the development of mixed assembly lines which have proved very successful in many instances. A good example of this is the assembly line at the Marmon plant, in Indianapolis, where three cars, the new car, the Roosevelt, and Models 68 and 78, are all assembled in the same line, as shown in the illustration. They are in the order named in the assembling conveyor, but this order is likely to be varied at any time to suit the demand for any of the models.



Assembling three models on one conveyor line

In order to secure satisfactory assembly of cars in this way it is necessary to schedule the supply of units and parts carefully so that they will feed into the assembly line at the proper time. Whatever the proportion of each model demanded by the schedule the dispatching of parts, whether made in the plant or purchased outside, must be so planned and scheduled that frames, axles, engines, fenders and other parts reach the line in proper sequence and at the right time. The proper body, both as to model and type, must be at the assembly line when the chassis is completed, or production will be hampered and the output schedule disarranged.

Use of a cutting lubricant, such as soda water or kerosene, will eliminate the principal difficulty in machining aluminum alloys, that caused by the clogging of chips which become wedged between the teeth of tools.

EXECUTIVE · FORUM

Equipment Replacement in Slack Periods

THE board room of the Ajax Corporation was blue with smoke, and all of the chairs around the big table were occupied. Evidently the business before the board had been sufficiently serious to bring a full attendance. And the presence of William Holland was additional evidence that his banker friend, Hare, a member of the board, realized the fact.

"Mr. Holland," said the chairman of the board, "you have heard enough of our discussion thus far to understand that this corporation is in an excellent position financially. The disturbance in Wall Street has had no discernible effect on it, as yet. Our cash reserves are higher than ever before in the history of the corporation. Our order book is well filled. Nevertheless, some of us here are apprehensive over the trend of business during the next year, and we all want to be sure that we are right before authorizing a policy that is about to be proposed by Mr. Wood, our vice-president in charge of manufacturing. I wanted you to have that background before we take up the matter."

"Thank you, Mr. Wallace," returned Holland, "I should like to remark that if every corporation I know of had as secure a position as yours there would be little to worry about. I am very much interested to hear what Mr. Wood has to propose, but I have my suspicions as to what it is. But I'm talking too much—one of the evidences of advancing age."

The chairman glanced about the table. It was not hard to pick out the men who had been pinched in the stock market collapse. He wondered how their personal affairs would affect their judgment as directors.

"All right, Mr. Wood," he said, "let's have your story."

The active-looking, youngish vice-president got to his feet. In short, his recommendation was that two ancient buildings be torn down forthwith, and replaced by modern ones, and that his department be permitted to spend almost a half million on replacing obsolete production machinery. He stated his reasons and sat down.

Discussion immediately became heated. A few, who were far-seeing men and had not suffered in the market, were openly in favor of the move. Others, whose personal fortunes had been impaired, were against any appropriations. Still others were favorable to the improvements, but thought it better to wait until they could determine the trend of general business.

The chairman let the talk go on until every man had expressed his convictions. Then he turned to their guest.

"Mr. Holland," he said, "what is your opinion of this proposal? You have heard our views and you can see that we are in several minds."

"Well, Mr. Wallace, it strikes me that what you gentlemen have said about Mr. Wood's proposal is just what any similar board of directors would say, if called together this week to consider it. I'm afraid some of you are letting your personal affairs affect your business judgment. Not that I blame you particularly. If I had been badly nicked I might develop conservative ideas on appropriations myself.

"But, as I said before, I suspected what Mr. Wood would propose, and if he'll pardon the remark, I think it is what any progressive manufacturing head would propose under similar circumstances. You have a lot of ancient machinery in certain departments, you know, and the less said about those two buildings the better. I

What Do You Think?

Here is a situation that is facing many a board of directors at this moment. Shall they display faith in the basic soundness of business by going ahead with replacement programs? Or shall they "pull in their horns" and wait cautiously until they can tell the trend?

Shall the Ajax Company buy new production machinery at this time? Shall it build two new buildings? How should this board vote on the recommendation of its manufacturing vice-president? What will be the effect of its vote on the community?

can hardly be decently respectful of their great age."

"That's all very well, Mr. Holland," broke in a director who was not an officer of the company. "But how do we know there is going to be any need for that new equipment? If our orders drop off very much we'll be shutting down departments."

"Yes," chimed in another, "and perhaps we can just abandon those buildings and concentrate in the modern ones until the depression is over."

"Exactly, gentlemen, and in the meantime you will have lost the benefit of quick deliveries on your new equipment, and have postponed installation until you are so busy that any replacements will interfere seriously with your production schedules. And, as to the buildings, I should much prefer to do construction work when the plant is not running at capacity.

"But I suppose," concluded Holland, "that the thing is so clear to me that I'm biased. I've told you how it looks to an outsider, but you will have to make the decision."

There was more discussion, finally ended by the action of the chairman in calling for a vote on the recommendation.

DISCUSSION

OF PREVIOUS PROBLEMS

The Night Shift

So many troubles can arise in connection with a night shift that every effort should be made to get the work done by the regular day force. If the plant is short a machine or two required to get out the production, it is preferable to purchase these machines and put them in operation during the daytime rather than to run a night shift.

At one time I had charge of a shop in which the volume of output became so great that it was impossible to do the work with the regular day force. We had to establish a night shift. If new men were put on the night shift under a temporary foreman, I knew that the quality of the work turned out was certain to be inferior, and that many other difficulties would arise.

Finally, I put the best men on the night shift, paid them time and half-time, or piecework rates, and kept the new and inexperienced men on the day shift, at least until they learned the operations. When the new men became acquainted with the shop and with the work required, they were then given a turn on the night shift. As near as possible, the plan was to give each man two weeks on day work and two weeks on the night shift. This plan worked successfully and I know of no other way to solve the problem connected with a night shift. —J. T. TOWLSON, *London, England.*

Does a Highly Developed System Pay?

The ideal system is the simplest one that will correctly control the flow of work, record daily what is done, show in reliable cost figures the products that are profitable and those that are not, and that can be handled with a minimum of clerical work. As a rule, systems become more complicated as the size of the firm increases, a result largely of the division of the company into different departments. No one system will meet the requirements of all factories of a given size. A system that is successful in a shop making a standard product on regular schedules will not fit in a shop doing jobbing work.

A good system must take care of all sorts of orders and all emergencies, including the special orders that have priority over all others. When this work can be handled without the aid of chasers, an ideal system has been developed.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

What Shall We Teach Apprentices?

A man who can teach boys shop work and make the subject so interesting that they will like it, is worth more than most firms would probably be willing to pay him. To develop them into good machinists, apprentices should be taught such things as the correct cutting angles of tools, the feeds and speeds at which to operate equipment, the details of machine mechanism and movements, and similar operating factors.

The apprentice also should have a good knowledge of applied mechanics. He should be instructed in the installation and use of material handling equipment. The strength, composition, and characteristics of the various materials used in manufacturing, and the correct applications of these various materials are also subjects on which he should be given information.

After he has been taught all that there may be to learn in his own shop, he should be given an opportunity to gain a broader knowledge. I hand to my apprentices the technical journal to which I subscribe. It is surprising how much interest the boys display in machines they read about that are different from those they have operated in the various departments of the plant, how carefully they study operations on different kinds of work, and how readily they absorb information regarding production methods in other shops.

In the modern shop the boy stands a very poor chance of getting a general knowledge of engineering and manufacturing. Exchange of apprentices between different plants seems to be the only remedy for this condition. Such an arrangement was made by the firm in which I served my apprenticeship. Two apprentices were exchanged each year for a period of a year, and then each returned to his own shop. The arrangement worked well and gave to each boy a knowledge that otherwise he would have been unable to obtain.

—H. MAPLETHORPE, *West Bromwich, England.*

Spring Production

Fig. 1—A typical rear spring

SPRING production at the Studebaker plant at South Bend, Ind., is carried on in a large room, well lighted and ventilated, with stock storage and railroad facilities at one end and a conveyor at the other to carry the completed springs to storage. Each spring has eight leaves, the shortest being 10¾ in. and the master leaf about 62 in. long when flat. For the rear spring the eye-to-eye distance is 54 in. The material comes in bundles of flat stock 2 x ¼ in. in random lengths about 20 ft. long.

During its course of manufacture the stock is heat-treated to a Brinell hardness ranging between 387 and

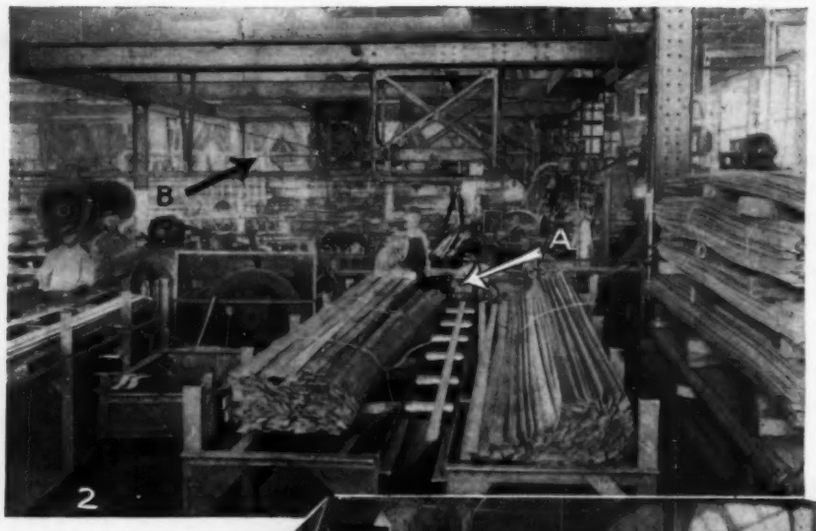


Fig. 2 — Shearing to length is the first operation. It is performed on two machines at points adjacent to the stock storage space. Alligator shear *A* is fed by hand. The sheared lengths are placed in slings suspended from the conveyor shown at *B*, and are carried to the operations that follow

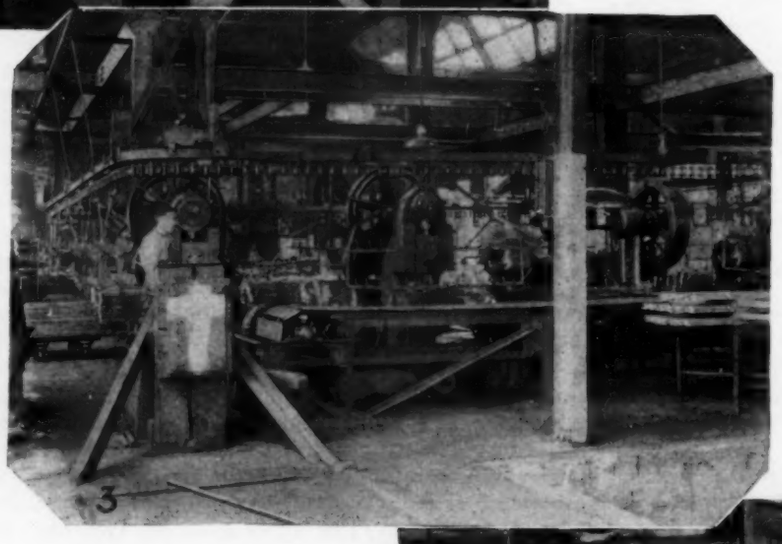


Fig. 3—All leaves, except the leaf next to the master, have V-shaped ends. The operation of pointing is performed on the three presses shown. The flat-flight conveyor brings the sheared stock to the presses, while the overhead conveyor carries the leaves to the furnace. En route, the center bolt holes are punched and the holes in the future eyes drilled

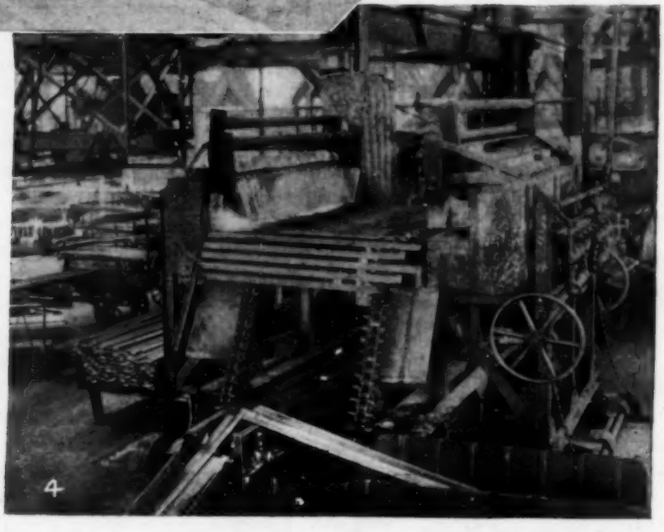


Fig. 4—Furnace for heating the ends of master springs for the "eyeing" operation. One end is curled at a time and the partially completed piece is returned by the flat-plate conveyor seen under the middle of the furnace. The other end is then heated and curled

on a Large Scale

shown in the flattened position

444. Every master leaf is checked by ball impression after it leaves the draw furnace, and about 7 per cent of the other leaves are examined for hardness. Because of automatic recording control of the furnaces, very few rejections are necessary.

About 75 men are employed in the spring shop. In the normal 9-hour day production is about 3,500 complete springs. These include four types for passenger models, besides truck and bus models. Because of their limited speed, the cambering machines and furnaces, of which there are two sets, are run 24 hours a day.

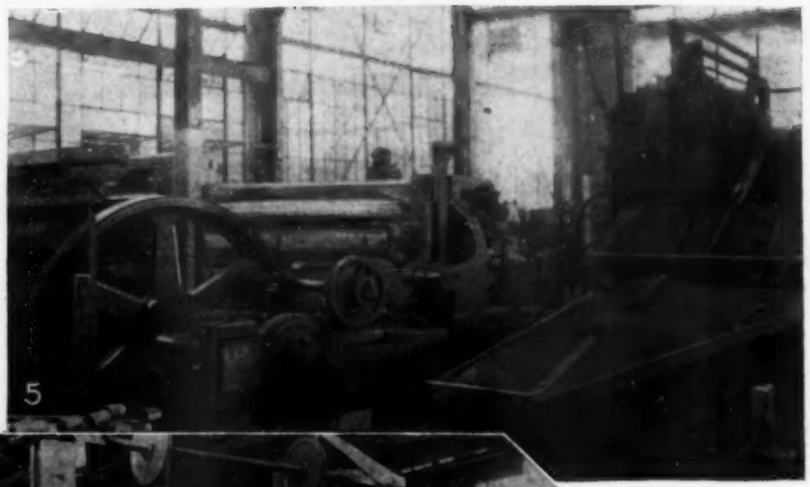


Fig. 5—In this machine the leaf ends are curled over and then hot broached. Leaves with both eyes completed are loaded on hand trucks and transferred to the cambering furnace

Fig. 6—Charging end of the furnace for heating prior to the cambering operation. The furnace is automatically controlled at a temperature ranging between 1,575 and 1,650 degrees

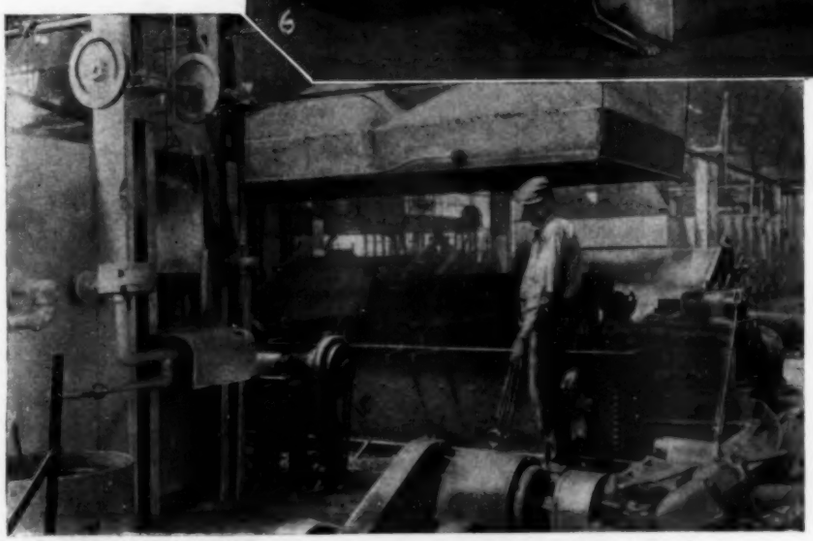


Fig. 7—Each leaf is withdrawn from the furnace through the side door and is then placed in the cambering machine. When the operator depresses a treadle the heated piece is bent and instantly submerged in oil, where it is held for about ½ minute

. . . Spring Production on a Large Scale

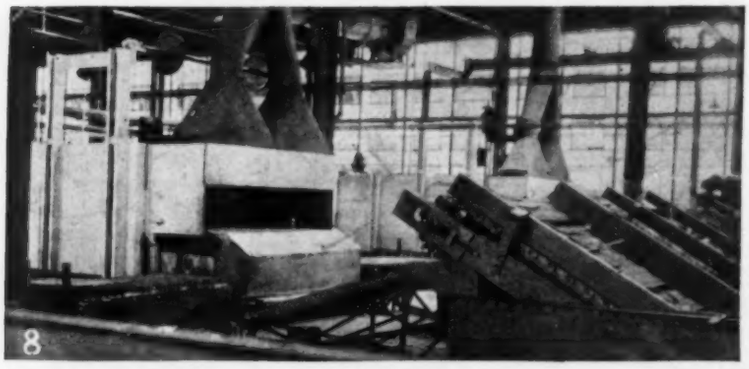


Fig. 8—A flat-plate conveyor takes the leaves from the oil quench and drops them onto an incline where they receive a visual inspection before being charged into the drawing furnace shown at the left

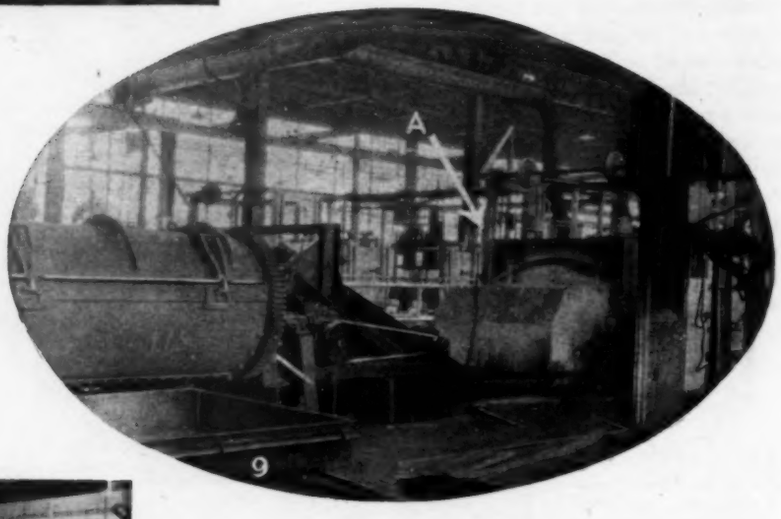


Fig. 9—From the drawing furnace the leaves are discharged into warm water so that they will dry on their way up the inclined conveyor. Here the master springs are Brinnelled 100 per cent, and 5 per cent of the others are checked for hardness

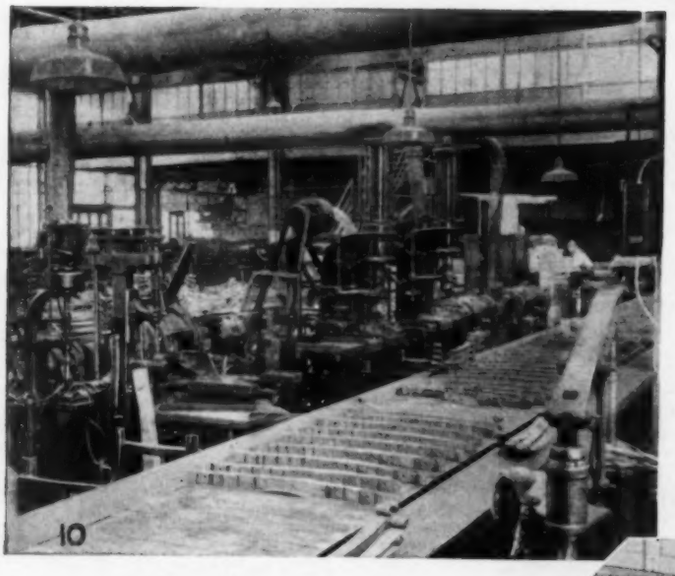


Fig. 10—Looking down the assembly conveyor line. In the first step the bronze bushing, previously inserted in the eye by power press, is broached and the sides of the eye are ground to the dimension 1.990-1.995 in. between opposed disk grinders. A later operation consists of riveting the clips to the second leaf in a punch press. Then graphite is applied by running the leaves through a brushing machine, after which the eight leaves are assembled to the bolt

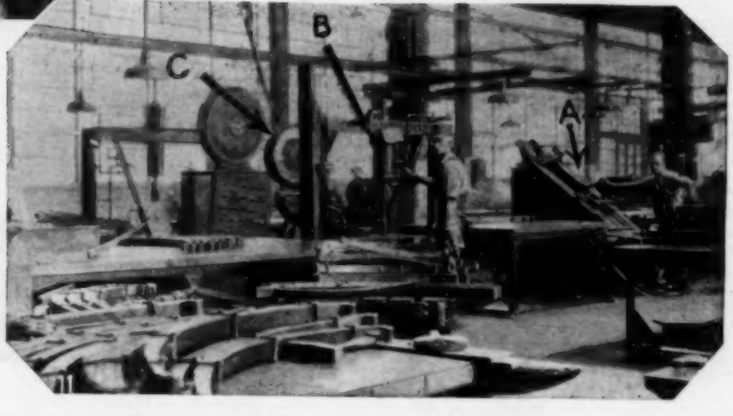


Fig. 11—The assembled spring is first loaded and "brought to grade" in the bulldozer *A* to give it an initial flexure before being weighed at *B*. The load is applied pneumatically and is read on the weighing scale *C* shown in the background

German and Skoda Tolerances Compared—

Discussion

By Dr. George Schlesinger

Professor, Berlin Technical Institute, Charlottenburg, Germany

Fig. 1—Plug and ring gages employed in making the tests

It was the intention of the editors to terminate this discussion with Dr. Sawin's article in Vol. 70, page 397 of *American Machinist*. Dr. Schlesinger's reply, which he terms his "last word" on this subject, is so pertinent, however, that it is presented here

IN HIS article published in *American Machinist* page 397, Vol. 70, Dr. Sawin does not deal with actualities, but discusses the replies received from the German industrial managers, published in the magazine *Werkstattstechnik* which hardly can be sup posed to have been read by many Americans, or even by American readers of *American Machinist*. Therefore, the latter are not able to follow this criticism which does not at all do justice to the contributions upon which an attack is made. Consequently, I deem it desirable again to clarify the principle involved in the controversy and to bring the discussion to an end.

Dr. Sawin establishes a system of fits which, according to his statement, does not require the same amount of skill on the part of the workman, as the German D.I.N. system. The workman is supposed to be given a snap gage and a plug gage to observe their limits, and be able to maintain them, even if he has but little experience in working to limit gages. The German "fine grade" fits have tolerances which are far too small, for this procedure, to be followed by the average workman, according to Dr. Sawin. On the other hand, he says, the German "medium grade" fits have tolerances which are larger than permissible for the purpose mentioned. Moreover this class of fits does not permit of interchangeable manufacture of parts with *tight* fits (push, wringing, tight, medium force, heavy force fits*) which have not been included in the series for this reason.

***In translating this article, the terms "snug", "wringing", "tight", "medium force", and "heavy force", according to the tentative American standard on "Tolerances, allowances, and gages for metal fits", (B 4a-1925), approved by the American Standards Association, have been used for designating the practically identical fits in the German system, meant by the author. The "push fit" which does not appear in the American standard, is a transition fit of which the allowance lies between those of the "snug" and the "wringing" fits.**

On this account Dr. Sawin recommends that a "medium grade" series of fits be added with tolerances lying between those of the "fine grade" and the "medium grade" fits of the D.I.N. system, this additional series being claimed to guarantee—and this is the essential point—the correct application of the above tight fits. Dr. Sawin emphasizes verbally, and in writing, that *"push"* fits and *"wringing"* fits are those to be considered in the first place in his system.

An undeniable proof now can be given that Dr. Sawin's proposal, which is based rather on the point of view that the workman should not be trained, than on the actual requirements of interchangeable manufacture, cannot be applied in practice. For this purpose, the following practical experiments were made:

For each of the three "medium grade" fits—push, wringing, and tight fit—according to the Skoda-Sawin system, combination plug gages with three steps, are to be used as "feelers," and three ring gages are made, the dimensions of the latter being chosen so as to correspond, first, with the permissible minimum hole of the "medium grade," according to Dr. Sawin; second, with the permissible maximum hole; and, third, with the average hole, all measured with the reference block comparator and guaranteed true to 0.001 millimeters.

The plug gages, to be used as feelers, Fig. 1, are

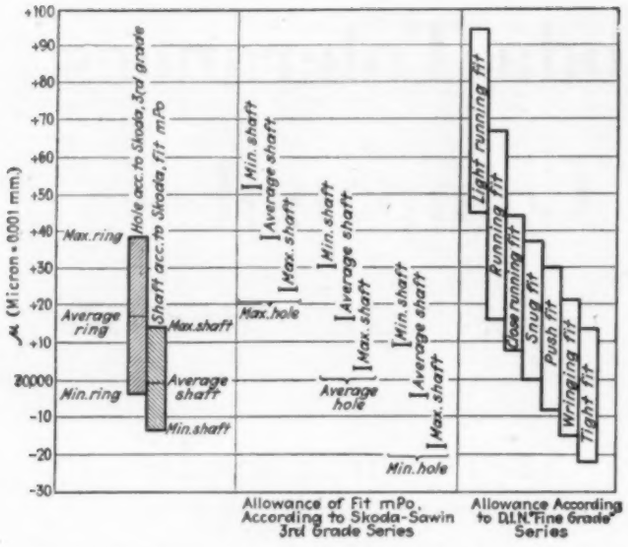


Fig. 2—Fit allowances in Skoda-Sawin and D.I.N. systems

provided with three portions of increasing diameter, each portion being given a dimension corresponding to the minimum, average, and maximum size respectively, of the shafts, according to the "medium grade" fits of the Skoda system, in the same way as this has been done for the ring gages. By introducing the plug gages subsequently into the three rings, the maximum hole can be combined with the minimum shaft, and the minimum hole with the maximum shaft. In so doing, it can be determined what effect is produced by the clearances or interferences.

If Dr. Sawin is right, he must obtain in all cases, *without instructions being given to the workman*, the push fit, for example. The investigation shows, however, that the maximum ring and the minimum shaft give a light running fit; that even the average shaft still gives a close running fit; and that the maximum shaft gives a snug fit. In no case, therefore, is there produced the push fit which Dr. Sawin wishes to get (Fig. 2). The delicate fits, push fit and wringing fit, which are of very great importance, are completely mixed up, in the Skoda-Sawin system.

If, again, the minimum ring is tried, the latter gives with the average and maximum shafts of the push fit class, absolutely tight fits which certainly cannot be characterized as "push fits," or even as "wringing fits"; in fact, they come close to the "tight" fits (according to American standard terminology).

This proves, in the first place, that the workman, in applying the new "medium grade" tolerances proposed by Dr. Sawin, to the three most important classes of fits, namely, the "snug," the "push," and the "wringing" fit, which are indispensable in assembling, may get so many rejections, that it must be strongly recommended not to introduce such fits into the workshop.

If, now, a restricted use of the Skoda "medium grade" fits were made, disregarding the three above mentioned fits, and by usilng exclusively the "tight," "medium force," and "heavy force" fits of the same grade, in order to be able to use at least those tight fits of the medium grade which are to be considered for permanent connections between parts, it will be seen that the latter fits cannot be tried by hand, as the forces required for the mating of the parts no longer can be supplied manually. Therefore, it is necessary to use a machine. In this connection, pressing tests now have been made for the relatively small experimental diameter of 30 mm., according to the accompanying table.

The manner in which the experiment was carried out is shown by Fig. 3. The holes and shafts were not given a high polish, as was done in the case of the "feeler" plug gages according to Fig. 1, but they simply were ground so as to have the high grade surface obtainable with good grinding machines when working to limit gages.

Test pieces were round and straight, in so far as the excellent machine equipment made this possible, and the diameters were tested to be correct to 0.001 mm. In other words, the pieces constituted a workshop product the quality of which cannot be surpassed even in the best manufacturing plants. They were made carefully by the Ludwig Loewe works, of Berlin.

In "medium force" fit, cases No. 10 and No. 12 of the table, where the maximum ring and the minimum shaft were put together, measurement of the diameters showed a clearance of 2 microns in one case, and 4 microns in the other. These cases, therefore, decidedly represented the extreme value of the clearance as may occur also in practice with a "medium force" fit of the D.I.N. system.

Despite this, it appeared, when the two parts were forced together on the hydraulic press, that there was no clearance between them, this fact being obviously due to the inaccuracy in shape, that is, the deviation of hole and shaft from perfect straightness and roundness. In fact, instead of a clearance, there was actually an interference, requiring a pressure of from 700 to 800 kg. for bringing the parts together in the tests made.

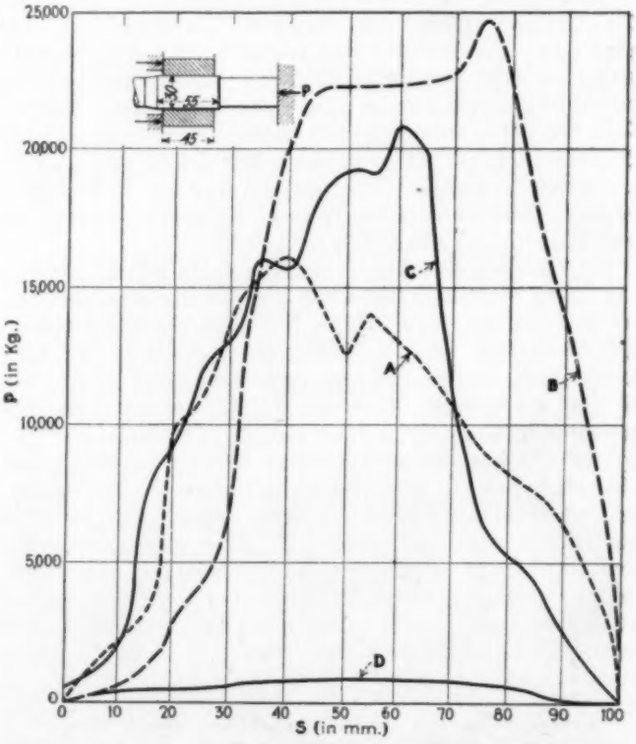


Fig. 3—Results of tests plotted in graphical form: A, experiment No. 1, "heavy force" fit, second grade, maximum interference; B, experiment No. 5, "heavy force" fit, third grade, maximum interference; C, experiment No. 7, "tight" fit, third grade, maximum interference; D, experiment No. 12, "medium force" fit, third grade minimum interference

If, now, it is assumed that not this relatively favorable condition occurs in the workshop, but the most unfavorable, namely, that in which the minimum hole and the maximum shaft happen to be combined—a condition which is likely to occur in Dr. Sawin's case, as he contemplates giving the workman no instructions—then there would be required for mating the "tight" fit parts (cases 5 to 8 in the table), pressures sometimes exceeding 20 tons, and this for as small a diameter as 30 mm. In consequence no workman in the assembly department would be able to mate those parts, the actual dimensions of which are close to the limits corresponding to the maximum interference.

Even for parts having average dimensions it was found that the pressures required were from 10,000 to 13,000 kg., which values correspond to the maximum interference of the "heavy force" fit of the "fine grade" in the Skoda system. If the parts were forced together by hammer blows or by means of screw presses this certainly would lead to the spoilage of the parts through bending or warping or even to breakage of the parts.

I consequently conclude that the possibility of the occurrence of excessive pressures in forcing the parts together when applying the "tight," "medium force," and "heavy force" fits proposed by Dr. Sawin, is considerably more dangerous than the occurrence of too loose fits, as the former impair the assembly proper, or create the danger of the parts being broken.

The considerations given to this matter by the Germans in 1918, and the decision, taken at that time, not to add tight fits in the "medium grade" series, thus are proved to hold good even for the "medium grade" fits of the Sawin system, although the latter have considerably smaller tolerances than the German "medium grade" fits. It is, therefore, justifiable emphatically to warn expert groups which contemplate going into manufacture, against Dr. Sawin's proposal to add tight fits to the series of "medium grade" fits. If Dr. Sawin, notwithtanding the above, declares that he has obtained good results with such fits in his own factory, this must be because of very special conditions in the Skoda Works, and of extremely strict instructions which he is able to give the skilled workmen of his works, despite the opposite theroretical standpoint advocated by him. Everywhere else in the world, however, such instructions are replaced by the use of suitable gages.

Dr. Sawin grants that the reduction in the tolerances on the small holes of the second grade ("fine grade") as proposed by him leads to the shortening of the life of the reamers. "But," he declares, "this may be compensated for by the use of adjustable reamers." He forgets, however, that there are no adjustable machine reamers for diameters of less than 20 mm. and this is exactly the range in which the tolerances on the holes of the "fine grade," according to Skoda, are considerably smaller than those of the "fine grade" according to the D.I.N. system. Moreover, in the case of the larger holes, for which adjustable reamers are available, the question of whether they have to be reset once or more often during a working day in order to be certain that the tolerances shall be maintained is highly important from the standpoint of economy. The largest holes to be finished by reaming have a diameter of about 150 mm. For still larger holes it is better to grind and lap, processes which make it much easier to maintain close tolerances economically than by reaming. It is for these larger diameters, however, that Dr. Sawin proposes to increase the tolerances.

Data on Press Tests with Pieces of 30 mm. Diameter.

No.	Fit	Ring — Variation from Diam. D, in μ — Value — Desired	Ring — Variation from Diam. D, in μ — Value — Actual	Plug — Variation from Diam. D, in μ — Value — Desired	Plug — Variation from Diam. D, in μ — Value — Actual	Clearance in μ — Value — Desired	Clearance in μ — Value — Actual	Maximum Pressure P in kg*
				2nd Grade Maximum Interference				
1	Heavy force....	0	+ 1	+35	+32	—35	—31	16,000
2	Medium force..	0	0	+25	+23	—25	—23	9,600
3	Tight.....	0	— 2	+20	+16	—20	—18	4,600
4	Wringing.....	0	— 1	+14	+13	—14	—14	4,700
				3rd Grade Maximum Interference				
5	Heavy force....	0	+ 2	+60	+57	—60	—55	24,500
6	Medium force..	0	— 1	+55	+52	—55	—53	21,300
7	Tight.....	0	— 2	+40	+37	—40	—39	20,800
8	Wringing.....	0	0	+30	+26	—30	—26	13,200
				2nd Grade Minimum Interference				
9	Heavy force....	+16	+16	+25	+23	— 9	— 7	13,000
10	Medium force..	+16	+10	+16	+ 8	0	+ 2	800
				3rd Grade Minimum Interference				
11	Heavy force....	+35	+34	+40	+35	— 5	— 1	2,000
12	Medium force..	+35	+36	+35	+32	0	+ 4	720

*The values show a very wide variation. μ = micron = 0.001 mm.

These are the most important points with regard to which the latest statements of Dr. Sawin completely contradict what generally is adopted at present as good practice. Consequently, it is also impossible for me to believe that a system of fits, which has been established on the basis of considerations of this character, could be mastered with less special knowledge of the subject on the part of the designers, and with less skill on the part of the workshop, than the D.I.N. system which has proved its value during so many years.

THERE are two general classes of bearing failures—engineering causes and service faults. The first concerns a quality of the anti-friction bearing itself, its design and manufacture. Failure in this case may be the result of incorrect steel, insufficiently worked steel, seamed steel, poor heat treatment, improper size or design, improper design of application and mounting, or lack of provision for keeping out dirt and dust or for providing sufficient lubricant and retaining it in the bearing. There are three main causes of failure in service—improper installation, insufficient or improper lubrication, and the presence of dirt or foreign matter. Improper installation often occurs merely because some mechanic has driven the race into position with an ill-considered blow from a hard-faced hammer or perhaps an outer race has been forced into the housing in such a manner as to leave it cocked, or with a metal chip on one side which may distort the race to a slightly out-of-round condition.

Machining Connecting Rods Without Distortion

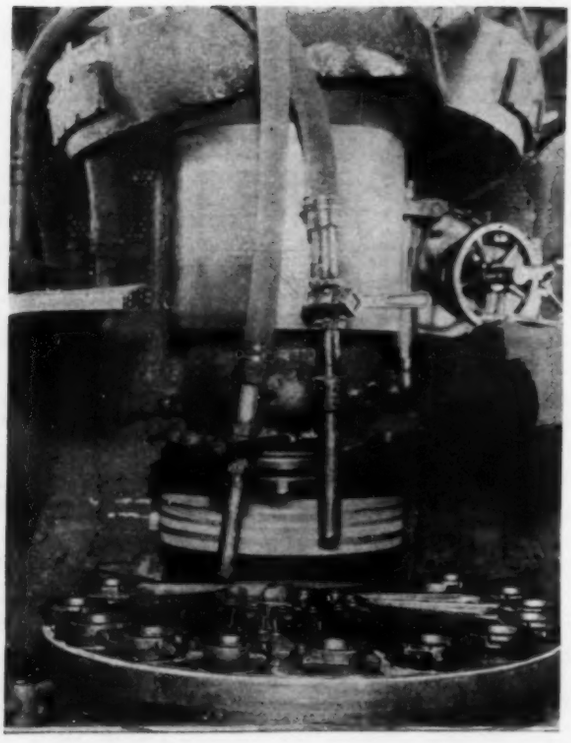


Fig. 1—Grinding sides of rod ends on a Blanchard machine. A magnetic chuck with a few stop pins holds the rods

Methods, machines, and fixtures by which parallelism and squareness of bores are secured without resorting to kinking or twisting of the rod. Analytic preplanning and specialized tooling applied

CONNECTING rod practice still varies widely, considering the large quantities of rods that are required for thousands of engines, many of which now take eight rods each. Nearly all connecting rods are finally aligned by kinking and twisting, if the final test shows that both holes are out of parallel. Opinions differ as to the desirability of this practice. The Pierce-Arrow engineers, as well as some others, feel that more permanent alignment is secured if the rod is not straightened after the holes are bored. They have, therefore, designed tools and fixtures which do not cramp or strain the rods while they are being held for the various machining operations.

Rod forgings are first coined under a heavy press, allowing 0.015 in. on each side for grinding on the Blanchard machine shown in Fig. 1. The magnetic chuck is provided with pins which serve to locate the small end of the rods and aid in holding them firmly against the cutting pressure of the wheel. The two large nozzles in front of the wheel flood the parts during the grinding operation.

Using the ground surface for squaring the rod, the large hole is next drilled in the fixture shown in Fig. 2. The large end is centered by three prongs that project from the bottom of the drill bushing in the upper plate. This plate is guided by the two posts and is held down to the work by a heavy spring on each side. To insert a rod for drilling, the operator raises the plate by means of the lever *A*. The bushing plate is raised by the threaded rods at each end which are actuated by short levers on the outside of the base. Two nuts on the threaded rod permit adjustment of the plate to regulate the opening for the connecting rod. Locking a fixture by spring pressure and opening it with a single bar, is much simpler than any other method of holding. It can be used in any place where chips do not interfere with the accurate closing of the fixture.

The rods are then put into the broaching machine, as in Fig. 5, and the large hole is broached ready for babbitting. The fixture is simply a plate with a flat face and two pins to guide the upper end of the rod.

The small end is rough drilled in the fixture shown in Fig. 4. The drill bushing is held in the plate above the rod, and is moved up and down on its guides by the handle shown.

Next, the sides of the bolt bosses are milled with the formed cutters shown in Fig. 3. The four cutters round the bosses of two rods on each side at once. The rod is held by the three sided stud in the small end and by the pin through the large end. The latch has a notched end that drops into a groove in the large pin and holds the rod in place. By raising the latch, the rod can be easily removed.

The ends of the rods are cleaned with acid, babbitted, and then rough bored on a vertical drilling machine. They are next split, or have the caps separated, in the fixture shown in Fig. 6. This fixture holds two rods, side by side, as can be seen at the small end. It is of

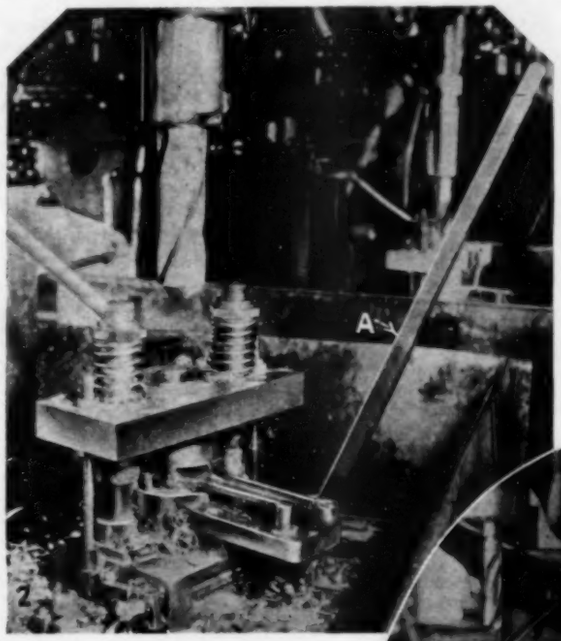


Fig. 2 — Rough drilling the large end of rod in fixture with a bushing that centers the rod end by prongs on the outside

Fig. 4 — Drilling the small end in a pair of fixtures under a double spindle drilling machine. The rough bore of the large end fits over a rectangular stud as shown

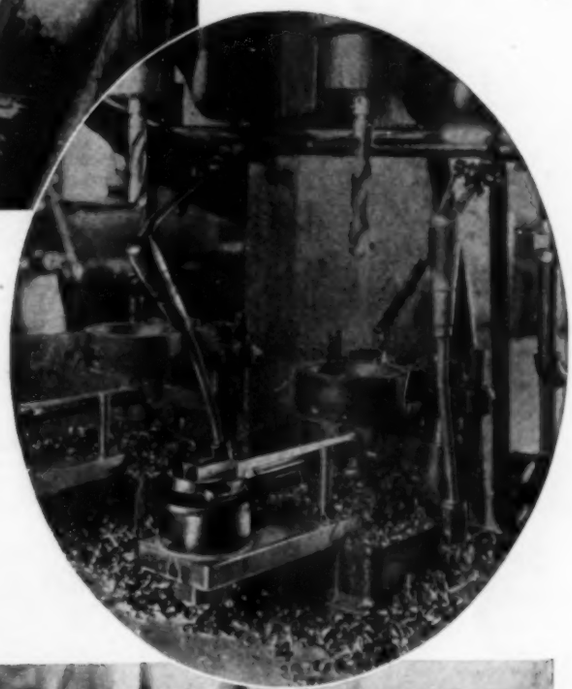


Fig. 3 — Milling a radius on the bolt boss of both sides of two rods at once. A duplex machine with four formed milling cutters are used with a special fixture

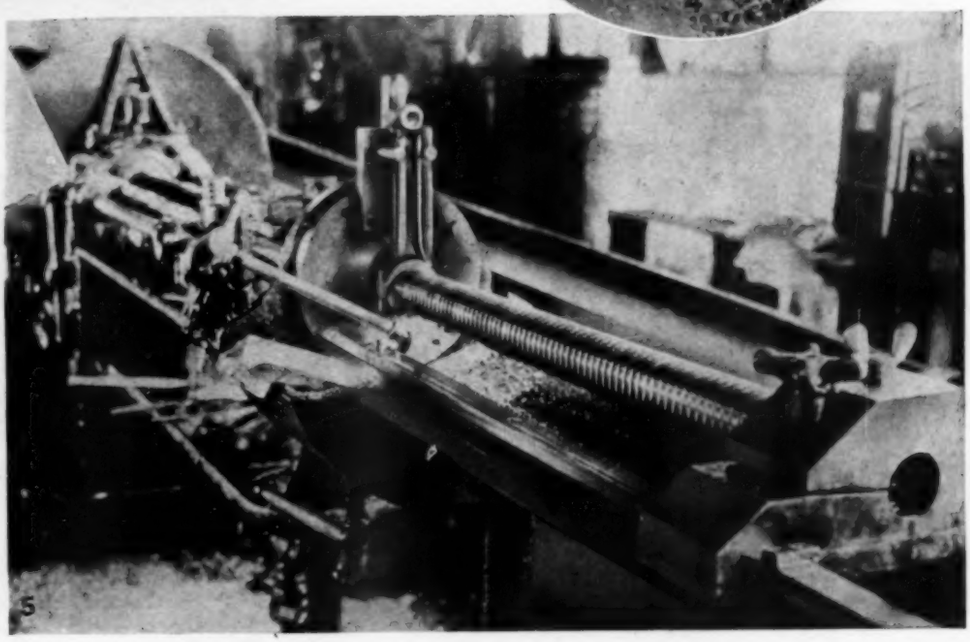


Fig. 5 — Broaching large end of rods in a double fixture. The pins center the upper end while the lower end is positioned by the pull broach

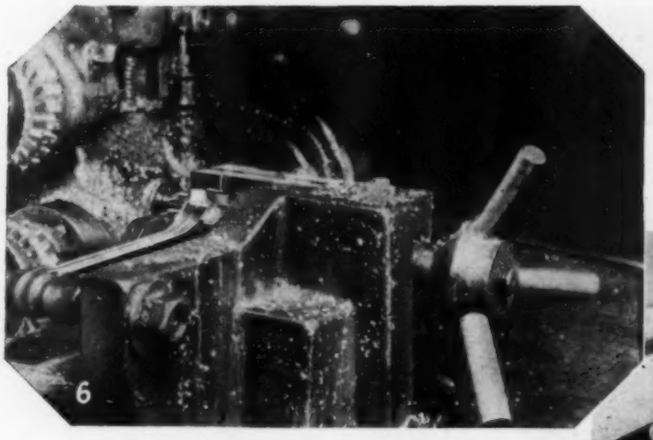
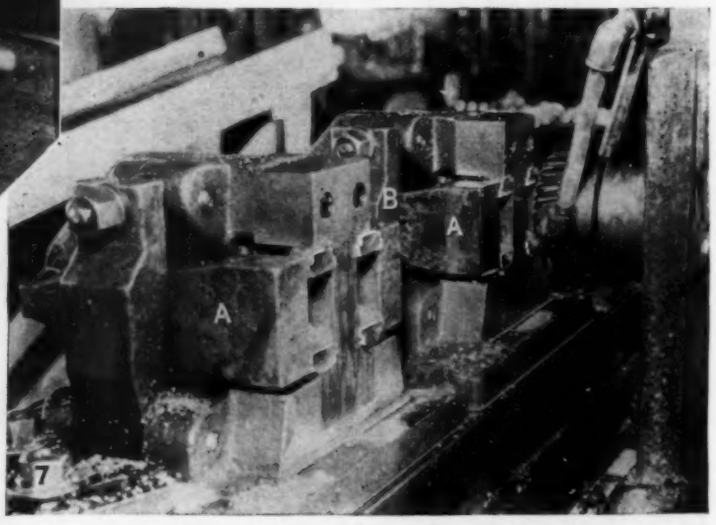


Fig. 6—Separating the caps from the rods and milling faces on each end of bolt bosses. Both sides of the rod are machined at the same time

Fig. 7—Special fixtures for milling the face of both rod and cap. One fixture is loaded while the milling is being done on the other



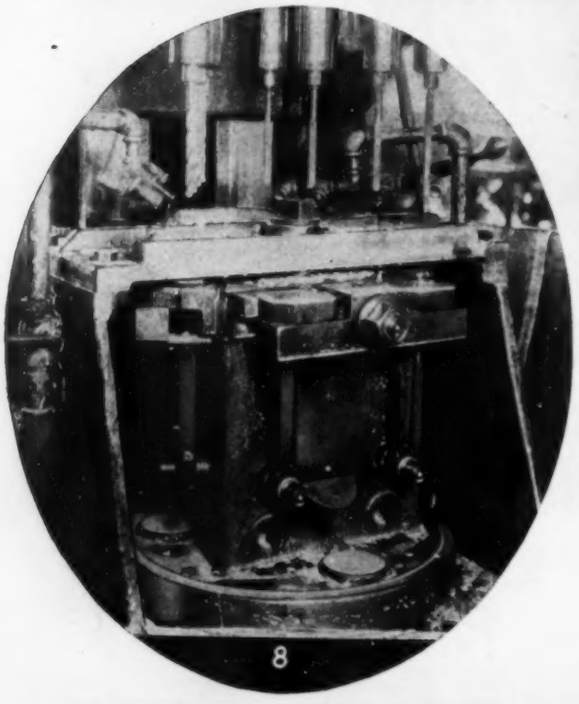


Fig. 8—Drilling and reaming bolt holes in four rods at one setting. The two rods in front are in the loading position. The fixture indexes to the left

Fig. 9—Finish milling for the lock on the side of the connecting rod bolt head. A simple fixture and a hand milling machine are used

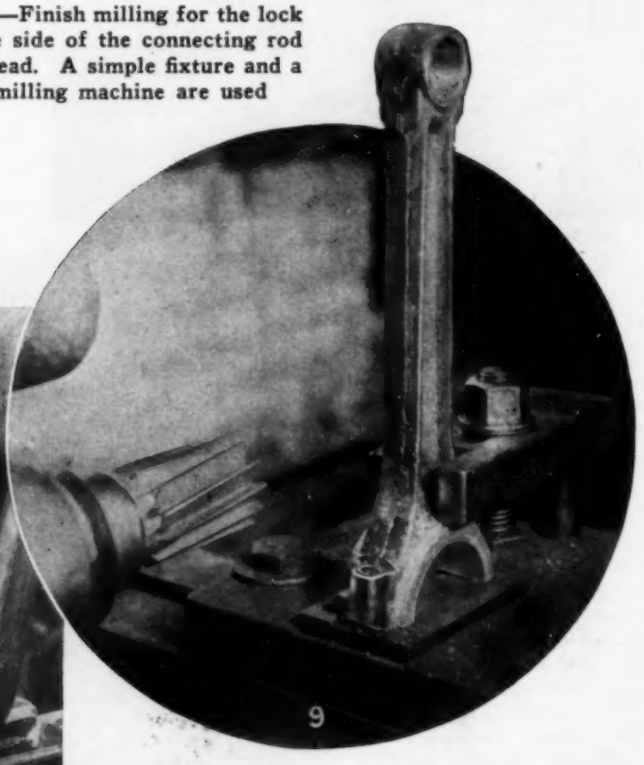


Fig. 10—Splitting small end of the rod for clamping the piston pin. The inclined fixture and double cutters enable two rods to be split at once

heavy design and construction, and the guide on top permits the passage of both cutters and the slitting saw. The saw separates the cap from the rod while the cutters face the ends of the bolt bosses.

After the separation, the mating surfaces on both rod and cap are milled in the fixture shown in Fig. 7. These fixtures are of particularly heavy design. The horizontal clamps *A* are fulcrumed at the back end and forced against the work by the heavy swinging clamps at *B*. The outer surface of the bolt bosses, milled in a previous operation, locate both rod and cap between the guiding jaws of the fixture. The oil hole is next drilled in the cap, and counterbored, after which the rods are drilled and reamed as in Fig. 8. The three-sided fixture holds two rods on each side, locating the small ends on studs and clamping the large ends between jaws as in the previous operation. The finished sides of the bolt bosses are used for centering and squaring, in the upper end of the fixture. Both rods are clamped by a heavy equalizing bar at the top. Bolt holes are drilled in both rods by the spindle at the left. The next index station brings the rods that have been drilled under the reamers and a new pair is ready for drilling. Each drill and reamer has its own plentiful supply of coolant.

The bolt lock, which prevents the flattened side of the connecting rod bolt from turning, is finished on a No. 6 hand milling machine in the fixture shown in Fig. 9. The rod is positioned on dowels in the bolt holes and held square with the maiting faces by the forked clamp shown. Though this is a simple operation, it is desirable to have the surface under the bolt head square with the hole to prevent undue stresses on the bolt head.

Following this operation, the bolt holes in the bottom of the cap are counterbored, the mating faces of both rod and cap are finished on a bench lap, and the caps are assembled to the rod with an air drill. The babbitt is spot faced and the hole drilled in the small end for the clamping screw. Then the burrs are removed from the inside of the rod with a hand mill and the clamping hole is counterbored for the body of the bolt.

Splitting the small end of the rod, for clamping the piston pin, is done on the inclined fixture shown in Fig. 10. The large end of the rod is located by the bore, at the upper end of the fixture, and the small end is also held on a stud. A cross clamp holds two rods at once and the angle allows the cutters to split the rods through into the bolt holes with enough of a space between the two parts to permit of easy clamping.

Then follows the tapping and burring of the clamping bolt hole. Next the babbitt is rough bored, and faced on each side, in a heavy-duty drilling machine, leaving 0.010 in. per side for finishing. The rods are thoroughly washed in a tank, carefully burred, and sent to the Coulter diamond boring machine, Fig. 12. Here the rods are positioned by the bore of the small end, and the babbitt in the large end is finished by removing a very light cut with the diamond tools in the cutter head. The rods receive no further finish in the bore. Scrapers and reamers are replaced by the accurate boring of diamond tools.

The final operation is the facing and sizing of the sides of the babbitt bearing with the tool shown in Fig. 11. This is a hand operation, the rod being turned by using the handle in the piston pin hold. The cutting head is on top, and is easily removable. When the rod has been placed over the central stud, the cutter is placed in position and locked by a crosspin. Then the rod is fed to the cutter by the capstan nut beneath. This nut is graduated, making it easy to feed the desired amount. Turning the rod by means of the handle, finishes the face and chamfers the inside edge or corner. After one side is faced, the rod is reversed and the second side is finished, bringing the length of the bearing to the figure specified on the drawings.

As stated at the beginning, no straightening of rods is permitted. They are checked by the usual inspection method and if they do not come square and parallel, they are rejected. There is likewise no selection of rods or main bearing shells. Diameters are maintained within limits that have been found satisfactory without individual selection.

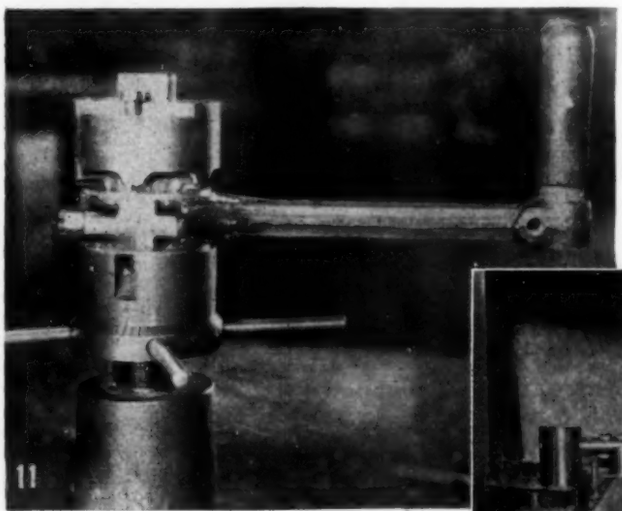


Fig. 11—Facing sides of babbitt bearing in special fixture. The cutter is stationary and rod is turned by handle in the small end

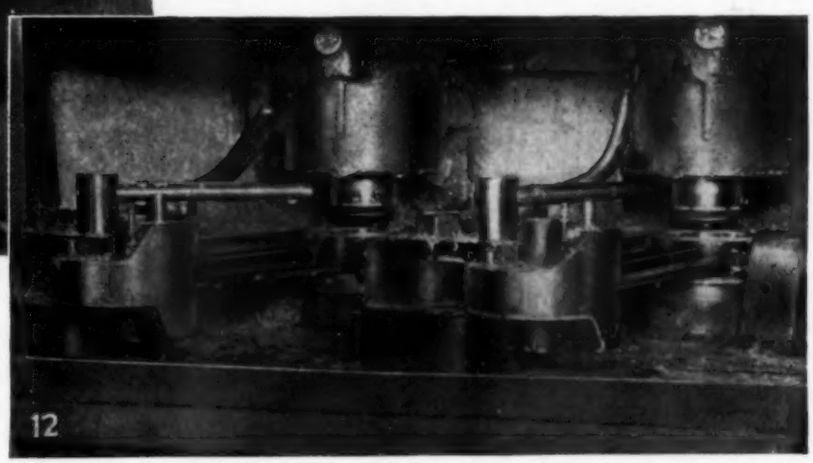


Fig. 12—Close-up view of double spindle diamond boring machine

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

The Ethics of Making a Change

WHEN Al and his family came home from the picture show, someone was sitting on the porch.

"Hello, Ed," Al hailed as soon as he recognized the caller, "Why didn't you say you were coming over? I would have stayed home."

"Didn't know it myself, Al. I was just walking around and thought I would drop in."

After his family had gone into the house, Al turned to Ed and said, "Tell it all, big boy. What's on your mind?"

"Well, when I got home from work I found a letter from the superintendent of the plow works. They are going to start a new department, and I guess my friend, Black, must have recommended me for the foremanship."

"Did you tell the wife about it?"

"I didn't have to. I can't seem to cure her of opening my mail."

"What did she say?"

"Oh, the increase struck her, of course. She has the first year's salary all spent, and was just starting on the second when I left."

"What do you think of it yourself, Ed?"

"I don't know what I think, that's why I came over. Williams has always treated me white, but the wife says I've been getting cranky lately, and maybe a change would do me good. What do you think?"

"Is the increase a substantial one?"

"Well, it's about twenty per cent, and I just know Williams won't 'see' any such raise as that."

"I know he won't, so don't put it up to him that way. He'd think it was a hold-up."

"What will I do, then?"

"Well, that depends on what value you place upon loyalty."

"What does that mean?"

"It means that there are other things involved besides money. When I am offered another job I ignore the money part until I find out whether I would want the job even without an increase. If I do I take it. If the job is no better, but the salary is attractive, I go to the boss and tell him how much I am offered and how much value I place on loyalty. That is, I add ten per cent to my present salary and give him a chance to pay the difference."

"Just what does that mean? I still don't get that value of loyalty stuff."

"Well, take your own case, suppose the plow works had offered you a ten per cent raise?"

"I wouldn't consider it."

"Exactly, ten per cent is your value of loyalty. You go to Williams and tell him that you would not consider changing for a ten per cent increase, but that twenty per cent is too much to pass up. If he wants you to stay, and I think he does, he will offer you the ten per cent raise, but he can't and won't give you twenty per cent, so don't try to bluff."

What are the ethics of quitting a supervising job? Is satisfaction with the present job worth something, or is money the prime consideration? Is discontent a sign of ambition, or of irritation?

All foremen are urged to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Why Some Tools Fail

ED WAS partly right in placing the blame for the failure of the new cutting tool on the machine. The condition of the tool post, spindle, and bearings was not conducive to securing the best results from the tool. Rigidity of the toolposts, and bearings, is essential, as the tool itself has certain structural weaknesses that must be catered to. Proper tool angles and clearances in relation to the material being machined are important. The new metal—which is not really a metal as we consider metals—lends itself more or less to its own distinctive cutting angles, on account of its hardness and structure. This has to be accomplished to a certain extent by the cut and try method to get the best results. In the matter of speed against the tool's life, tool life is certainly the most important. The less time consumed in changing tools, whether single or multiple, the more production is increased and the more machines a set-up man can take care of.

—T. KERR, *Tool & Gage Department, General Electric Company, Schenectady.*

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When Do Automatic Machines Pay?

AUTOMATIC machines pay when there are large quantities of parts to be made. Hand machines have the advantage over them in the manufacture of small quantities. Very often it is the customer who makes the decision as to which type of machine shall be used.

We have had a customer ring us up and inquire for prices on a large quantity of parts. The first question was "Have you automatics?" We informed him that we had not, but that we could give him a reasonable price and good delivery with our hand machines. He told us not to bother submitting a proposal, as it would be wasting time for both of us. So we had either to get automatics, or just be content to take on the small orders that were offered. As there is little or no profit in this, we were compelled to install faster machines.

It seems, therefore, that if Ed cannot convince Williams that automatics are faster and better his customers will; and if they don't, he will have a very lean time. And again, should Williams decide to install automatics, he should make sure that he buys the right kind, or he will find that his competitors have already scrapped the type that he intends buying.

—L. E. MARKEY, *London, England.*

Should Workers Buy Company Stock?

AS A MEANS of assuring the worker's interest and co-operation, stock participation is resorted to by many companies. But compulsion should not be used in selling company stock to the workers, as this may be harmful to the low-salaried men and to those who do not wish to have any part of their earnings deducted by the company, even though it will be saved and returned with interset.

I have found that there are two general plans for stock participation: first, those that require payments for the stock; and, second, those that give the stock to the employee as a bonus.

Inasmuch as the first plan is more or less in the nature of a direct investment, it comes more within the scope of the higher-paid official than the ordinary worker. Not all wage earners of the rank and file are inclined to make an investment where they must set aside a definite amount and retrench in their regular expenses to make up for it.

For this reason the second plan is the one under which much of the stock distribution to employees is made. Under these circumstances the employee secures his stock in addition to the market wage as a reward for extra achievement.

—HARRY KAUFMAN, *Public Accountant.*

*

Stirring Up the Foremen on Accidents

WHEN a workman sees that a guard has been left off a machine he should report it to a foreman, and the foreman should take steps immediately to have the fault remedied. I recall a difficulty that I experienced in having a motor guarded. I was operating a horizontal boring mill, and it was necessary to go to the back of the machine to make some of the set-ups. The motor of another machine had been set on the floor at the raer of my machine, with the pulley unguarded. Realizing that it would be very easy for anyone to step backward into this belt, I persisted until the pulley was guarded. I have always felt that this action avoided a costly accident.

Several days ago an accident was narrowly averted in our shop. An air hose had been strung through the steps of a steel stairway and over the railing, leaving the hose stretched nearly half way across the step. The stage was set perfectly for some unsuspecting person to take a headlong plunge down the stairway to the concrete floor. Someone discovered the hose, the matter was reported, and the trouble was corrected.

—RALPH N. STRYKER, *Tool Designer, Elliot Company.*

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Should the Workman Share Responsibility?

THERE is no question but that a workman should share to some extent the responsibility of his job. To err, however, is human, and a worker should not be fired for making a single error, unless it can be proved that the error was caused by direct negligence.

discussion is not limited to foremen. Letters accepted and published will be paid for

It is not the single error that proves the quality of the worker, but the accumulation of errors. They are the real barometer of his ability.

There are too many foremen who pass the buck down the line to the little fellow, and instead of sharing the responsibility of the job on a 50-50 basis they force him to shoulder the entire load. They are the type who, when the job turns out to be exceptionally good, pat themselves on the back and say "I gave that considerable thought," but on the other hand, should the job be not so good they immediately wash their hands of the entire affair and find some excuse to censure the little fellow.

—CHARLES E. KIRKBRIDGE, JR., *Asst. Chief Draftsman, U. S. Naval Aircraft Factory.*

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Radio in the Shop

I BELIEVE that for work on a production basis, where the men are repeating the same thing many times a day, radio might prove a convenient means to accelerate production. During the day the men are in and out of the shop, and are thinking about their own problems. Their attention is divided between the work they are doing, and their imagination. If the job is a routine one, their personal problems occupy the men's minds and slow down the work. If some external agent arouses the men from their pre-occupation, naturally the work is speeded up. In jobbing shops the radio idea is not good, because in them physical labor is secondary. The men are constantly employing their mentality in the solution of the problems at hand. If the radio should distract their attention, it would be detrimental to the work.

—FAUSTO BECERRIL, *Military Engineer, Chapultepec, Mexico.*

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Committees for Definite Shop Problems

I AM opposed to committees as a method of handling shop problems. There are usually several conditions that make such committees and their findings of little value. Among these are lack of authority, difficulty of maintaining interest after their suggestions have been overruled by an executive, and the difference of opinion that arises unless all are dominated by a forceful member of the committee, in which case the committee is also useless. It was my experience several years ago to work in a large plant where there was a committee for every conceivable problem. Many meetings were little more than "smoke talks," and the findings were often lost for lack of approval. The appointment to a committee has an effect on a man similar to giving a child a new toy. It is fine until the novelty wears off.

Additional ideas may be brought out now and then, but the sum value of these would not amount to as much as might be expected. I believe in giving definite assignments to individuals, they to take the responsibility and to have authority to render decisions. This usually gives good results and allows no room for "buck passing."

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

IT HAS been my experience, as a member of a shop committee, when I have approached the higher officials of a company with a statement as to certain unfavorable conditions under which work was being done in the shop, to be met with the reply "We were not aware of this, why were we not told before? We will have it remedied." And so it has been all along the line. When statements of particular problems have been made honestly and fearlessly, nothing but good has followed, and the only reason why bad conditions have been permitted to endure has been that the highest officials were ignorant of their existance. It is, therefore, my opinion, based on experience, that close intercommunication between employees and officials, through properly organized committees, is calculated to be productive of good.

—J. T. TOWLSON, *London, England.*

* * * *

THE · NEXT · TOPIC

"Advising Employees About Their Private Affairs"

Committees for Definite Shop Problems

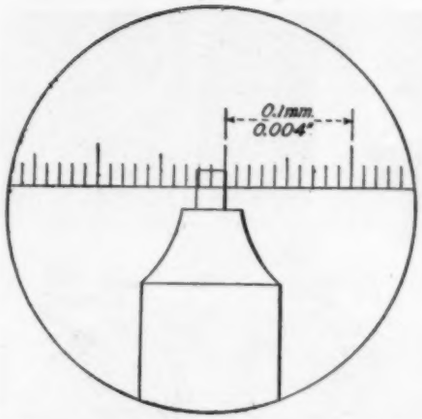
SUMMARY OF THE DISCUSSION

At Al's suggestion a committee of workers had been appointed to consider certain specific shop problems, such as spoiled work, accident prevention, and salvage. Ed looked upon the experiment as distinctly doubtful. Al was not at all certain as to the degree of efficiency with which such a committee would function, but he hoped that the responsibility placed upon them would act as an incentive.

IT WAS agreed that the real reasons for appointing shop committees, and the greatest benefits to be derived from them, are the opportunities they afford for self-expression and exchange of ideas. There are, of course, managers who like an audience, and workers who like to dictate, but their attitudes pass with the novelty. In general, the tendency of committee work is to change unthinking, individual workers into a planning, creative unit. In order to do this, however, both workers and management must approach the plan with mutual confidence in its efficacy.

Conference committees may be used to good advantage in any shop where a large number of men are employed. The employees elected from the different departments appreciate the added responsibility and react accordingly. Such a committee is a good medium for handling suggestions for improvements.

On the other hand, it was contended that it might be better to use them for research and similar functions as the engineering societies do, and allow matters of management and discipline to rest in more experienced hands. A competent executive is more effective in that respect than a dozen committees.



The cutting point of a small punch seen through a microscope having a micrometer eye-piece.

Production Operations on the Zeiss Planetarium

By Henry Simon

Punching microscopically small holes in copper foil required punches ground to less than 0.001 inch in diameter

IN CONTRAST to the rather coarse and heavy operations on the balls, the work of producing the 9,000 holes for the star-image plates in the Zeiss Planetarium required the greatest exactitude. These holes are of 65 sizes, corresponding to as many astronomical magnitudes, and range from a maximum of 0.030 in. to a smallest diameter of 0.0009 in. The natural thought would be to produce the hole patterns by some photographic or etching process and both these expedients were at first tried. It was found, however, that neither procedure gave entirely satisfactory results. Too much light was absorbed by the photographic film, while the roundness of etched holes in metal foil was not always what it should be, whereas the roundness was an important consideration from the point of view of the projected image.

The method finally decided upon was that of punching each individual hole by hand. To this end, an enlarged plan of the field of each projector was first drawn up in ink upon a piece of sheet brass coated with white paint. A photographic reproduction of one such original is shown in Fig. 10. It will be noted that each star is represented by a round black dot denoted by a number. This number signifies the magnitude and at the same time identifies the punch to be used. For instance, 58 means that the star is of the 58th magnitude, and that the hole must be made with punch No. 58, the diameter of which is about 0.0015 inch.

The extent of the black dots is also the limit of permissible error in location. As the punches for stars of the largest magnitude are nearly the size of the dots, while the smallest punches produce tiny holes quite invisible to the naked eye, it follows that the center-to-center distances are more severely limited for the large stars than for the smaller ones. This is as it should be, since the larger stars are practically always the more important objects. It should also be mentioned that in practice, the location of even the smallest holes is fairly central and therefore always well within the limits provided.

The crossed double-dots represent stars so near each other that it becomes necessary to maintain their direction more closely than would ordinarily be the case under the limits just mentioned. The concentric circles are merely for reference, while the meridianal and latitudinal lines correspond to the astronomical map. Except for the stars and the nebulæ, the only markings projected upon the artificial heavens are the field number and the corner lines. These markings are represented by rows of closely-spaced punch marks and serve merely at the initial centering required in adjusting the instrument. Once the image is centered, these marks are deleted, in as far as projection is concerned, by coating

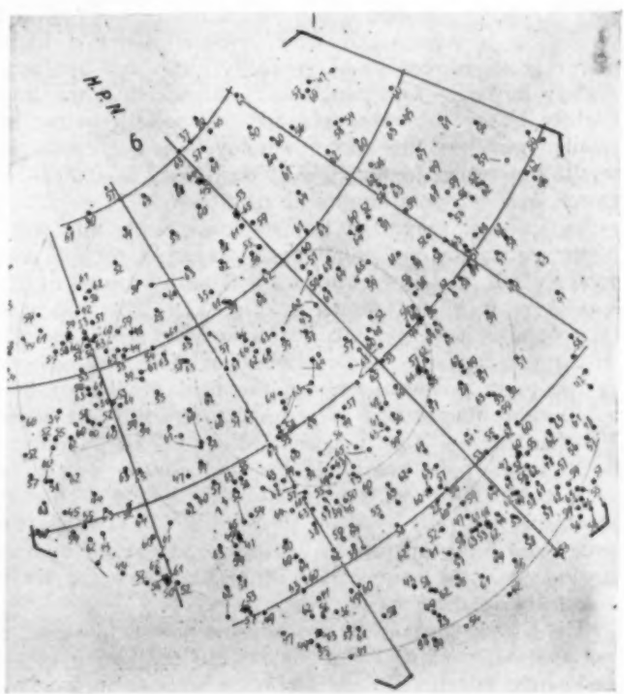


Fig. 10—One of the 32 star-fields. The numbers denote the magnitudes of the various stars, there being 65 different sizes of holes in the fields, varying from 0.0009 to about $\frac{1}{32}$ in. in diameter

The second and last article on production features of the Zeiss Planetarium. The previous article appeared in Vol. 71, p. 691. Design features of the planetarium were dealt with on pages 227, 433, and 625 of Vol. 71.

the glass plate over the image with black varnish.

The punching operation is shown in Fig. 11. The sheet-copper foil, of 0.0006 in. thickness, is stretched in a holder consisting of two rings that snugly wedge upon each other when the foil is in place. With the foil side down, the holder is placed upon a smooth square of sheet lead resting upon a surface plate. The operator wears a pair of magnifying glasses of the binocular type, which permit him to see all details without having to get close to the work. With the punch held exactly straight up, he puts a light and slightly sliding pressure upon it, thereby making the perforation.

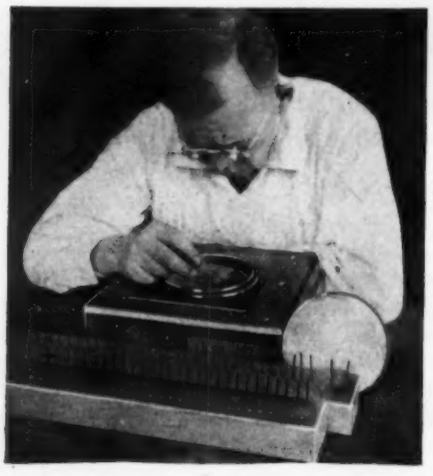


Fig. 11—Punching holes in the star plates. The copper foil is clamped in a frame over a square sheet of lead. The blocks hold the 65 sizes of punches

Contrary to what might be expected, the punch gives way very suddenly, causing a sensible diminutive shock and producing a hole which when viewed under a high-power glass, is seen to be perfectly clean and but very slightly burred. The punching is imbedded in the lead slightly below its upper surface. Especially with the smaller punches the forces employed are exceedingly small, amounting in the case of the finest, or 0.0009-in. punch, to less than a hundredth of a pound.

An unusual operation in connection with this work is the procedure in grinding the punches to size and facing them. Both operations are done by means of the special arrangement shown in Fig. 12. The punch to be ground is held in a small draw-in collet in the spindle of a precision lathe, while a wheel of Arkansas oilstone is fed to it. Mounted above the field of operation is a binocular microscope giving a magnification of about 100 diameters so that the smallest, or 0.0009-in. punch, will appear to be nearly $\frac{3}{32}$ in. in diameter, as can be seen in the figure at the head of this article. This instrument not only enables the operator to watch the progress of the operation, but by means of an optical-projection scale contained within it, allows the exact size to be read off as the work proceeds.

The first operation on the oilstone wheel, however, is not that of grinding the diameter, but the facing of the end of the punch. This is necessary because the working end of most of the punches is so fine that any attempt to face it after it had been ground to diameter would result in breaking it off. For this reason, the end is made just long enough to work, and this entire length is ground off each time in sharpening the punch.

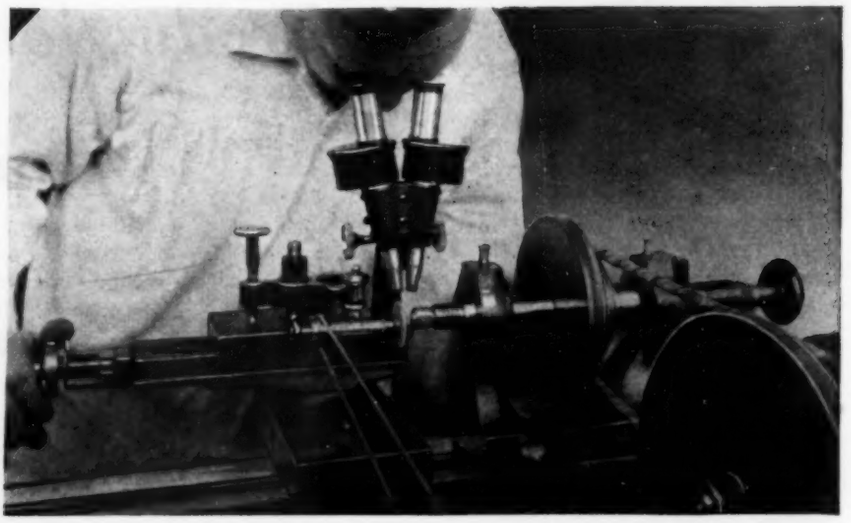


Fig. 12—Regrinding one of the star punches. The old point is completely faced off and the diameter of the body is reduced to size. It is often necessary for the operator to use a microscope when working on the small punches

Another problem encountered was that of centering the filaments of the electric lamps used in the projectors. All of the various sizes of lamps are held in place on the instrument in adjustable-socket bases seating always in a like manner against registering surfaces provided for the purpose. These registering surfaces, together with the various center filament distances, are reproduced in the centering stand shown in use in Fig. 13. The small lamps are centered with the help of a telescope equipped with a hairline cross. The larger lamps are merely "sighted" across pairs of holes located in opposite uprights at the proper height above the base surface. By sighting each lamp in two directions at right angles to each other, the approximate center of the filament is quickly located, whereupon the socket is clamped down to its seat, with the assurance that the lamp will be centered in the instrument.

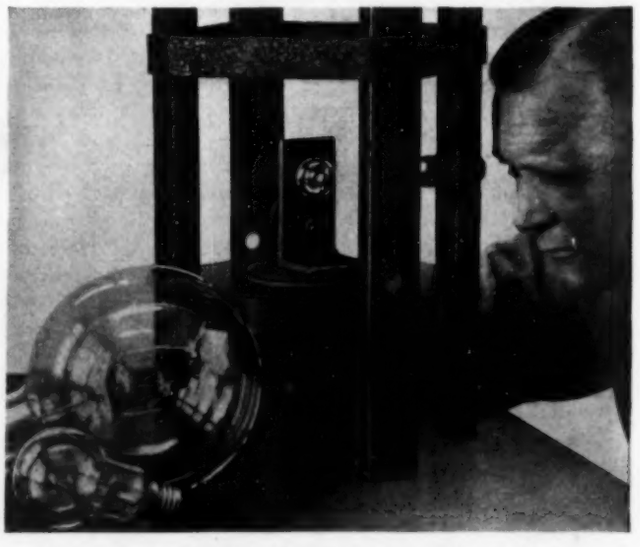


Fig. 13—Centering the lamps relative to their filaments. The small lamps are centered by the aid of a short-focus telescope equipped with cross hairs. The larger lamps are "sighted" across holes in opposite uprights

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Portable Furnace for Melting Brass

By HENRY H. HENSON
Cincinnati, New Orleans & Texas Pacific Railway Company

Most large railroads have brass foundries at their main shops, but the branch shops are generally poorly equipped for melting brass. Such shops, even though they have melting furnaces, have no facilities for making sand-molded castings. Yet it is often necessary for them to pour molten brass in such places as the hub surfaces of driving boxes and the liner shoes of cross-heads. Sometimes it is necessary to renew the crown brasses by casting them in the driving boxes.

To meet the needs of a railroad shop that has no brass foundry, the brass-smelting furnace shown in the illustrations was designed and built. The complete furnace is shown in Fig. 1, while in Fig. 2 are shown the details, including the principal dimensions of the various parts. As will be seen, the furnace is mounted on wheels and can be moved to any part of the shop. It can be built at a moderate cost and the burners (for either kerosene or fuel oil) can be bought from manufacturers who specialize in this type of equipment.

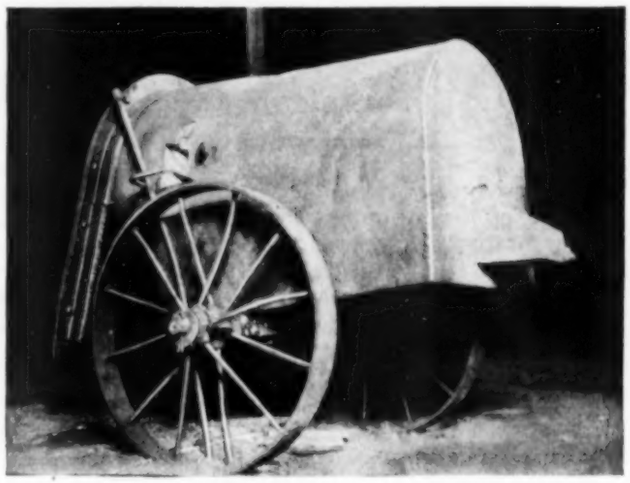


Fig. 1—Portable furnace for melting brass

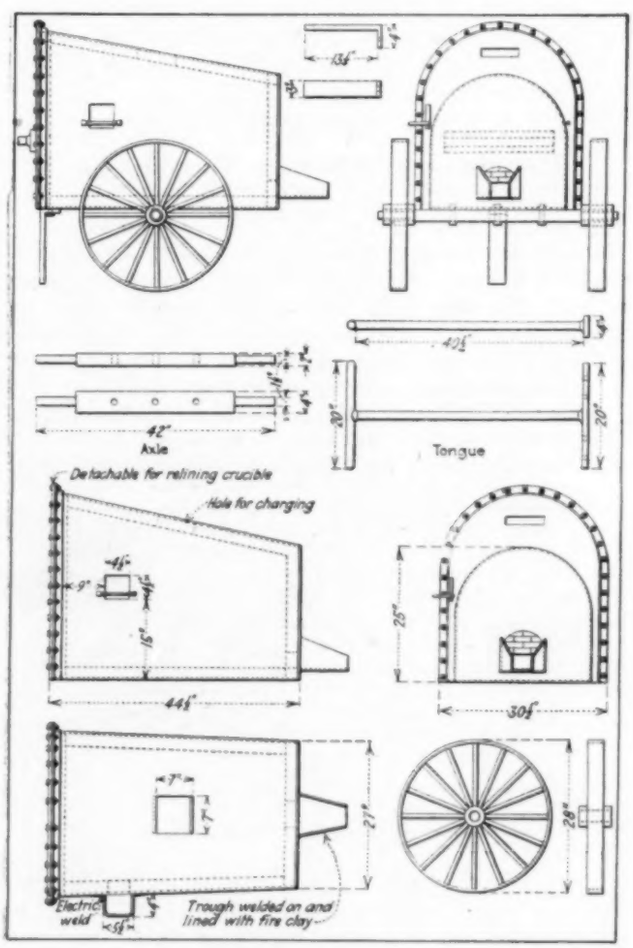


Fig. 2—Details of the furnace

Drilling a Curved Hole

By HOMER MARION

A sole-stitching machine for making shoes uses a needle curved to a 1 in. radius. It is important that this needle be firmly supported while it oscillates, and this necessitates drilling a curved hole through the guide bar as shown in the illustration.

Needle bar and needle of a sole stitching machine. The needle oscillates in the arc of a circle in a curved hole with 0.002-in. clearance

The method of doing this is quite simple, and can be performed on any speed drill. In the present case, however, it is done on a special horizontal, two-way drill because of the quantity used. The piece is registered from

the $\frac{3}{8}$ hole, on a pin in a bearing. One end is provided with a lever extension. One of the heads, with a drill shaped something like the old time flat drill is engaged and clamped. The lever then swings the end of the needle bar on the required radius.

When the shank of the drill, which is smaller than the point, crowds the side of the hole, the piece is swung in the opposite direction and the other drill head finishes the operation.

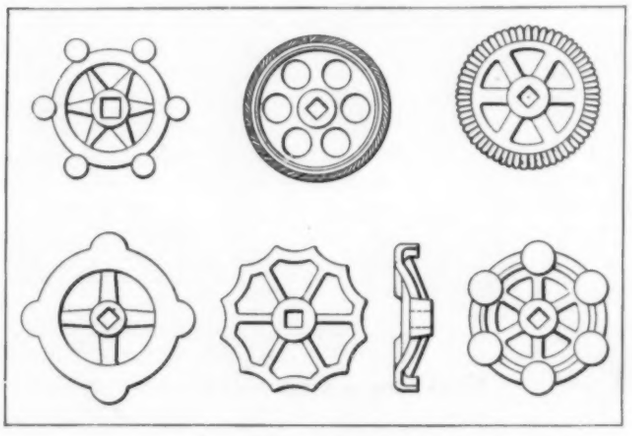
After the drilling operation, a steel ball is used to burnish the hole.

Valve Wheels for Use on Jigs and Fixtures

By H. L. Wheeler

Tool designers adopt various styles of hand grips for the clamping devices of jigs and fixtures some of which are comparatively expensive, considering the patterns that must be made for the various sizes.

I have found that the wheels used on standard valves make excellent non-slip, hand grips and are superior in many ways to some of the grips designed by various tool designers. They can be obtained from dealers in mill supplies at a nominal cost, and in sizes up to six inches in diameter. While valve wheels usually have square holes, they can be used by squaring the ends of the



Various styles of valve wheels

clamping screws, or the holes can be made round by drilling and reaming. They make a neat job on jigs and fixtures, where hand grips are required.

Some of the styles available are shown in the illustration.

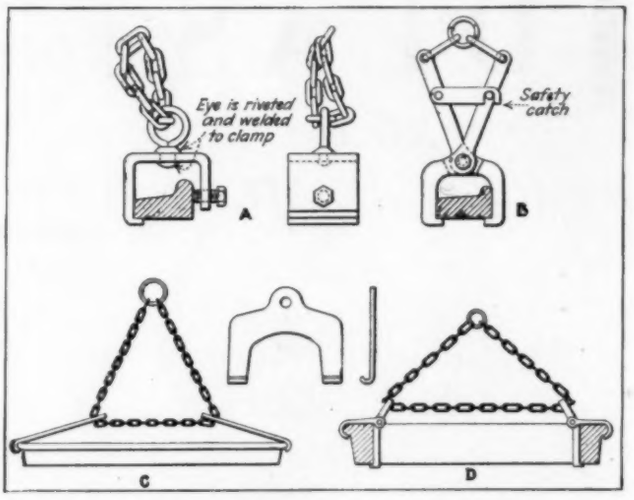
Devices for Handling Driving-Wheel Tires

By Henry H. Henson

Cincinnati, New Orleans & Texas Pacific Railway Company

Devices that facilitate the handling of material with maximum safety and speed are good additions to any shop.

At *A* is shown a clamp for holding driving-wheel tires while they are being hoisted and carried in a vertical position by a traveling crane. The offset lip and the setscrew hold the tire securely and prevent it from slipping. At *B* is a pair of convenient tongs for holding



Various devices for handling driving-wheel tires

tires while they are being lifted and carried in a vertical position also. The tongs are self locking.

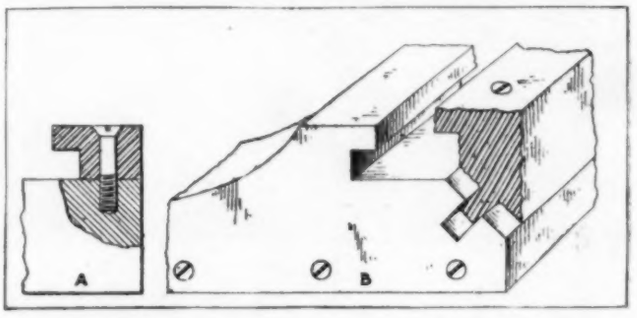
The grab hooks at *C* are used for lifting and carrying tires in a horizontal position. The hooks can be cut out of $\frac{5}{8}$ or $\frac{3}{4}$-in. boiler plate by a cutting torch and then bent to conform to the shape of the tire flange. At *D* is shown a pair of hooks for lifting and carrying tires in a horizontal position also. These hooks are much safer to use than the ones shown at *C*, as the lower ends of the parts that are fastened to the chains have offset lips that lock the hooks on the tire as it is being lifted. There is no danger of the tire shifting after it has been lifted, or of its falling out of the hooks.

Repairing T-Slots in Toolblocks

By Charles Kugler

Sometimes the metal around the T-slots in the toolblocks of lathes is broken out so that the toolpost cannot be held. In such cases repairs are generally made by cutting away the broken metal down to the bottom of the slot and fastening a strip of steel machined as indicated at *A*. Repairs made in this manner are weak.

A better method of making the repair is shown at *B* The broken metal is cut away at an angle of 45 deg. and a comparatively deep groove is cut at a right angle

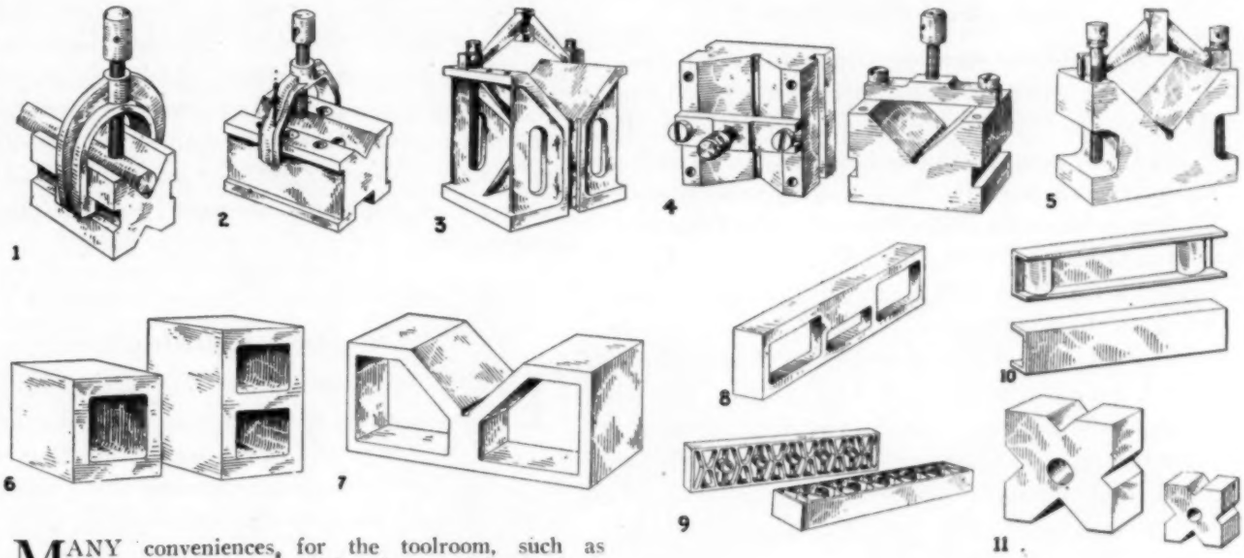


Method of repairing a broken T-slot

to the planed surface. A piece of steel, machined to the shape indicated by the sectional lines, is fitted in place and fastened with screws. The tongue should be a tight fit in the groove. Repairs made in this way are almost as strong as the original casting and will last a long time.

Toolroom Conveniences

Commercial V-Blocks, Clamps, and Parallels



MANY conveniences, for the toolroom, such as V-blocks, clamps, parallels, vises, and levels, have become generally standardized, and are obtainable commercially. While most of those shown on this page are reproductions of particular manufacturer's products, they are typical of the class of material available.

The V-Block shown in Fig. 1 is made of cast iron, finished, and accurately grooved. It is designed for use in holding round work during drilling and for laying out work in connection with a surface plate or knee. The set includes two reversible and interchangeable blocks, and one clamp. Each block is 2 in. long by 1½ in. square and will take work up to 1½ in. in diameter.

In Fig. 2 is shown a similar tool for holding small circular or rectangular pieces for milling, grinding, or drilling. The reversible block of steel, machined and case-hardened, is 3 in. long by 2 in. wide and 1¾ in. high. The clamp will hold round stock up to 1 in. in diameter and rectangular stock up to ¾x1¼ in. This tool may be used as a vise, anvil, V-block, or centering clamp.

Manufactured to meet the need for blocks finished in pairs, and of sufficient size to handle the larger jobs encountered, the 6-in. to 8-in. block illustrated in Fig. 3 is of cast-iron, cored. A tongued groove and a bolt hole, central with the "V," are provided in the bottom and in one end. Exterior surfaces of the V's are accurately ground to size in pairs, and the ends are finished square with the V. The clamps may be inverted, set at any one of three positions, and released quickly.

A block, similar in clamping arrangement to the one shown in Fig. 3, is shown in Fig. 5. These blocks are made from tool steel hardened and ground, and are numbered in pairs. All dimensions of paired blocks are the same, and all surfaces are square with each other. The reversible clamps are drop forged and heat-treated, and may be released by loosening the clamp screws slightly. These blocks are 2⅞ in. high, 4 in. wide, and 2⅞ in. long, with a V, 2⅜ in. wide at the top, and a clearance groove, ⅛ in. wide at the bottom. Maximum capacity, 3-in. round.

The precision V-blocks shown in Fig. 4 are made from tool steel, hardened and ground all over, in pairs. The V is ground to a 90-deg. angle, in perfect alignment with the sides and base, at right angles with the ends, and central with the sides. The 3-position clamp is designed so that it will not interfere when the block is being used on its side. Two grooves are provided for clamping.

A general utility cast-iron V-block is shown in Fig. 11, with V's on four sides, all accurately machined in relation to a reamed center hole. The smaller one pictured is 1½x3x3 in., the larger 3x6x6 in., and there is an intermediate size. The angle of the V on each face is different.

The cast-iron V-block shown in Fig. 7 provides an excellent means of clamping in the cored-out portions. They vary in size from 2¾x3¼x6¼ in. to 8x8x8 in. The larger sizes are made with a vertical strengthening rib.

Two examples of the familiar cast-iron box parallels used for larger classes of work are shown in Fig. 6. They are made of special heat-treated cast-iron, finish ground all over to size with a limit of plus or minus 0.0005 in. Stock sizes vary from 4x4x6 in. long to 6x14x16 in. long.

Ribbed parallels similar to the one shown in Fig. 8 are made of malleable iron, seasoned and treated to hold their shape and retain their accuracy. They are ribbed for strength and lightness and are ground square and accurate to within 0.0005-in. limits. They can be bought singly, in pairs, or by the set. Sizes vary from ⅜x¾x6 in. to 1½x3x16 in., ten sizes being available.

In Fig. 9 are illustrated a pair of larger, surface-ground, cast-iron parallels designed for accurate set-up on larger machines. The parallels are heat-treated and bolts may be put through the cored holes shown. Width and thickness are held to within plus or minus 0.0005 in., and they will pair to these limits. Five sizes are available, the smallest being 1½x3x24 in. long and the largest 4x8x36 in. long.

A pair of channel parallels are shown in Fig. 10. They present three finished surfaces and finished ends, but cannot be built upon so readily as the more familiar types. They are reinforced at the ends as shown. Sizes available are 2x4x12 and 2x4x20 inches.

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Industrial Handicaps

IT IS possible to carry on a manufacturing business at a profit, although probably a small one, even though it is handicapped by antiquated, ill-lighted and poorly equipped buildings. A recent survey trip through the New England territory by a score of McGraw-Hill editors disclosed this fact. It should be said, parenthetically, that they found conditions in New England typical of those elsewhere in the country.

At the same time, it was obvious that the companies not so handicapped were having a much easier time making a profit, and were making a bigger profit. The plants with modern buildings and modern equipment were running full time, and had been continuously, even when the older ones were entirely or partly down.

But why put up with such handicaps? Why not tear down the old buildings and replace them, or else abandon them altogether? Why not modernize the equipment? Every one of these old plants, with very few exceptions, had been written off the books. Unless something strange in the way of finance had taken place, the money must have been there for rebuilding, else why depreciate?

Aside from the obligation to its stockholders, management owes a duty to the community. It must keep its facilities up to date or else it assumes a handicap that makes operation difficult for itself, and reflects seriously on the city in which it is located.

*

Taxation—A Sore Spot

INDUSTRY is somewhat concerned over the possible results of the stock market flurry, without much reason. It is not so concerned over the colossal mess which the Senate is making of the tariff. It should be, because the effects are likely to be far more lasting.

These two subjects are front-page news, but their effect on business and industry is trifling compared to that of stupid, and occasionally crooked, tax legislation and administration. Federal taxation is under fairly satisfactory control, but state and local taxes have run wild. Politicians have undertaken all sorts of public improvements with an eye to catching votes, and industry is footing the bill.

There is no particular point in quoting statistics; every taxpayer is well aware how much more he is paying now than he did fifteen or even ten years ago. Yet what is he doing about it?

Perhaps a period of not so prosperous business would fix the attention of the manufacturer on how badly he is being stuck. And then he might do something about it. At present he seems to be content to leave protests to association executives and others who are rightly or wrongly classed as lobbyists in legislative centers, and discounted accordingly.

*

A Cue from Washington

THOSE responsible for the management of metal-working plants throughout the country will do well to take their cue from President Hoover in Washington. Sensing the possibility that the small business depression existing in certain lines this autumn may be aggravated by the stock market readjustment, the President has been quick to insist on immediate action to remove the minor objections that have been holding back governmental construction work and shipbuilding.

In both of these fields of activity there is real need of equipment modernization. Many of the federal departments are seriously handicapped by obsolete buildings, just as many industrial plants are handicapped. Almost without exception American shipping companies are struggling with pre-war ships against foreign competitors equipped with the latest in ocean-going bottoms, just as many manufacturing plants are trying to compete with pre-war machinery against the many times more productive machines of today.

President Hoover's prompt action should help to bring the panic-stricken to their senses. Industrial leaders will do an even more helpful thing if they release at once orders for replacements of obsolete equipment that have been held back until the demand for immediate shipments of their product eased off enough to give them a breathing spell. They should bear in mind that American business is growing at the steady rate of nearly five per cent each year, and that equipment must be improved to keep pace. A brief pause now only means extra pressure a little later on.

SHOP EQUIPMENT NEWS

Simplex "Multimechanic" Multiple-Operations Machine

ALL of the various machining operations can be performed on the "Multimechanic" multiple-operations machine, according to the manufacturer, the Simplex Manufacturing Company, Motor Coach Terminal Building, Spokane, Wash. These operations—turning, drilling, boring, milling, grinding, planing, and shaping—are made possible by the great number and variety of movements. For example, both turrets may be fed along the bed at rates ranging from ½ to 4 in. per min.; their spindles have vertical travel of 20 in. at a rate of ½ to 5 in. per min., and they may be swiveled through the full circle, fixed stops being provided at the 30-, 45-, 60- and 180-deg. points. Both turret indexes read in half degrees from zero to 90 deg., inclusive. The work table has feeds similar to the turrets, reciprocating speeds from 20 to 130 ft. per min., and a travel of 3 ft. The cross table measures 48x12 in. The length of the bed is 10 ft., which may be increased in increments of 2 ft. Three toolposts are provided and two faceplates, one 8 in. and one 14 in., respectively.

As examples of what the machine will do, Figs. 1 and 2 are provided. Fig. 1 shows how two opposite faces may be milled at different heights at the same time. In Fig. 2 is shown how a turret may be swiveled to any angle to facilitate cone turning such as for bevel gear work, and how any cone may be threaded or spiral cut by the engagement of the longitudinal and traverse feeds. Another set-up employs a standard lathe chuck in the left-hand turret spindle. The work is drilled and bored in the ordinary way, and face turned, and then cut off by reversing the spindle and using the back toolpost containing a cutting-off tool. This piece may also be keyseated by the use of a tool held in a third toolpost. This operation may be performed repeatedly without changing or resetting any of the tools, thus simulating turret lathe work. Also, by elevating one spindle above the other, any number of holes may be drilled in any location in the work by indexing the chuck. An example of a boring job which may be performed, is that where a standard boring bar is supported and driven by the spindles and fed by the aprons on the feed screw. This work may also be milled and drilled at any location on both sides, in addition to being slotted and shaped.

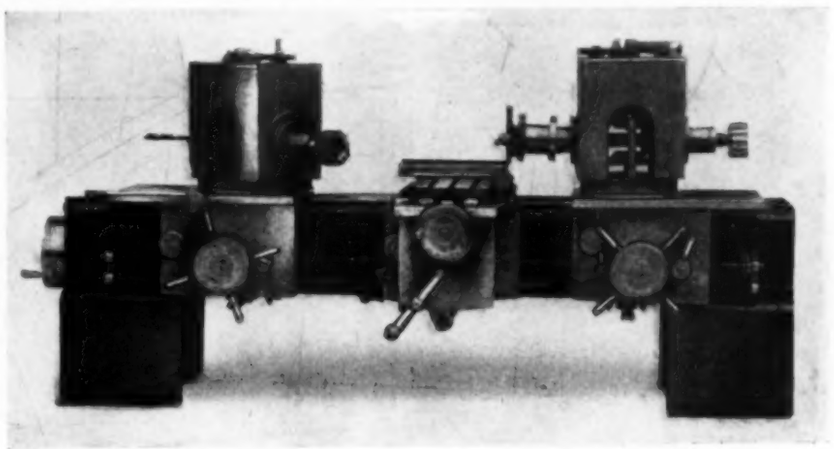


Fig. 2—The turrets may be swiveled so that cone turning is facilitated

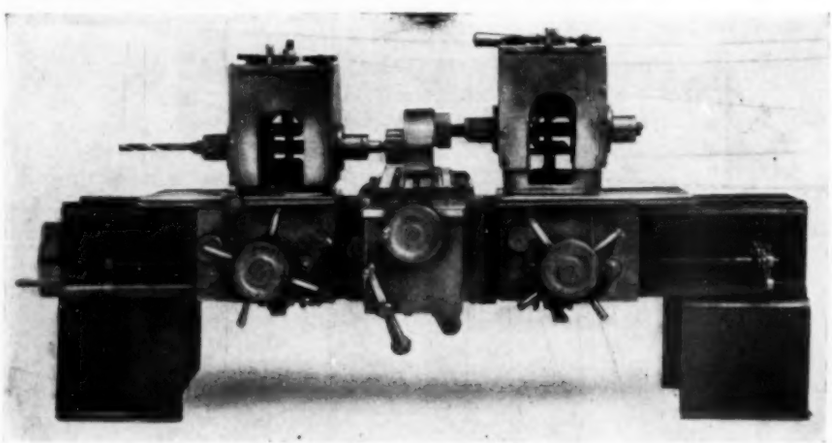


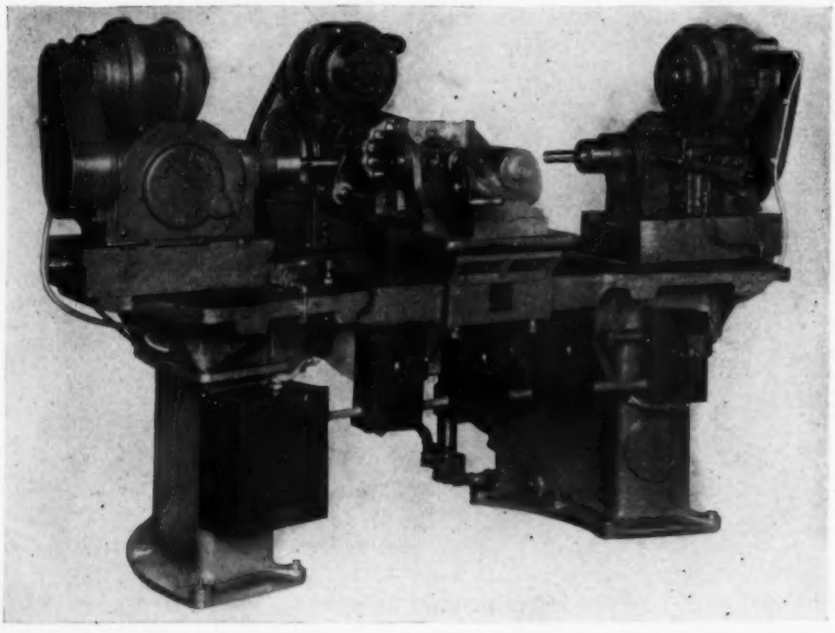
Fig. 1—Milling at different heights on opposite faces of work placed in the Simplex "Multimechanic"

The machine is manufactured in modified forms to meet the requirements of high production manufacturing, and may be adapted to continuous mass production. For the latter, the regular cross bed is removed, together with the platen, and in their place is put a long, heavy cross bed similar to the main bed, and provided with a long feed screw. Short platens are then loaded with duplicate pieces to be milled and are fed through the cutters continuously, the platens being returned and reloaded, thus keeping up a continuous circuit. This principle has been extended, using a longer cross bed over a number of unit machines, the work having certain specified opera-

tions performed at each unit. The platens in this case are unloaded at the end of the run, and returned and reloaded. This practice can be further extended on work requiring operations other than milling, by conveying the platens with their load to other individual units, where they receive other operations. The machine may be adjusted quickly for an almost indefinite variety of sizes and shapes of work.

Bradford Three-Head Drilling and Reaming Machine

FOR drilling twelve $\frac{23}{64}$-in. holes through the flange of a malleable iron differential case and also drilling and reaming two cross pin holes 0.8625 in. in diameter, the three-head drilling and reaming machine illustrated was recently furnished by the Bradford Machine Tool Company, 657-671 Evans St., Cincinnati, Ohio. The cutting speed is 80 ft. per min. and the floor to floor time is 60 sec. per piece.



Bradford Three-Head Drilling and Reaming Machine, which is arranged to drill twelve 23/64-in. holes through a malleable-iron differential case flange and also drill and ream the two cross pin holes to 0.8625-in. in diameter. The floor-to-floor time is approximately 60 sec. per piece

The work is located in the fixture from the two ground end trunions in conjunction with an equalizer bar that locates the cross holes in the proper position. The fixture is of the conventional pump type jig actuated by a quick-clamping lock.

The operator clamps one part into the fixture and trips the feeding mechanism of all heads simultaneously by means of a hand valve located at the front of the machine. This valve connects the small air cylinders, one of which is shown attached to the tripping lever of the head at the right front of the machine. This action causes all spindles to advance simultaneously to perform their respective operations, after which they will return to the starting point and stop. After the feeding mechanism has been tripped, the machine requires no further attention from the operator as all the machine functions from this point are fully automatic. The operator is therefore able to handle from two to four machines simultaneously.

The machine consists of two No. 2 Bradford single-spindle drilling units, each of which is equipped with a 2-hp. motor, and the cams of these units are arranged to advance the spindle as follows: Rapid traverse $3\frac{3}{8}$ in., drilling feed at 0.010 in. per revolution, $1\frac{1}{4}$ in., reaming feed at 0.018 in. per revolution, $1\frac{1}{2}$ in., and a rapid return of 6 in. The third unit is mounted at the back of the machine and is a standard No. 5 drill head equipped with a 5-hp. motor and a 12-spindle auxiliary drilling attachment. The cam on this unit is arranged to give the following spindle action: Rapid traverse $2\frac{3}{8}$ in., feed at 0.010 in. per revolution, $\frac{5}{8}$ in., and a rapid return of 3 in. Each of the units is arranged to slide on a subbase, the adjustment being controlled by means of a leadscrew mounted at the left front of the machine.

The Bradford units are standardized equipment and each is fully automatic and self-contained. The motors are arranged to drive through a train of gears to the spindle and the spindle speeds may be varied to suit the requirements of each production job by changing pick-off gears. The control of the spindle action and feeds is obtained through a positive-type cam actuated by means of gearing from the main spindle drive. The spindle action may be varied as required by changing cams and the feed per revolution on any cam may be changed by means of pick-off gears. On this machine the three units are located 90 deg. apart in a horizontal place, but they are designed so that they may be assembled in any grouping, position, or angle that might be required by any individual job.

All three units are lubricated through Zerk fittings, using a heavy oil, and the units are so arranged that the oil is pocketed in such a manner as to cause the more important moving members to be continuously operating in a bath of oil. The pedestal on the right-hand side of the machine constitutes a tank for the coolant compound. This carries a turbine pump for transmitting the cutting compounds to the tools. The piping to the individual tools is not shown.

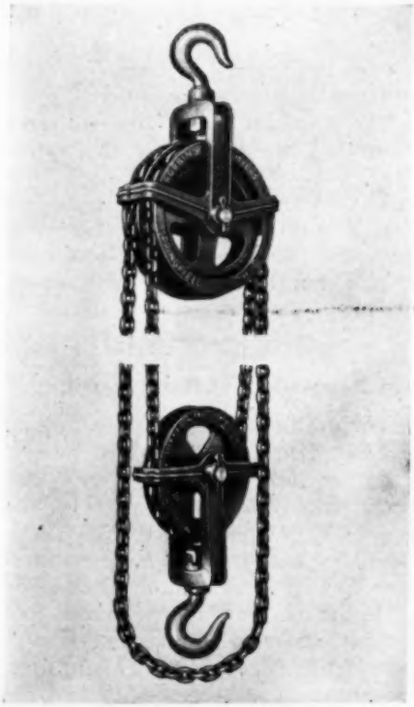
A push-button control is provided to stop and start the machine. This control is protected by a suitable magnetic switch. Each motor is also equipped with an individual switch, and with individual fuse protection so arranged that any motor may be cut out at will without affecting the operation of the other units.

The feeding mechanism on all units is controlled through a simple poppet-type valve located at the left front of the machine. This is connected to a small air cylinder or plunger attached to the individual tripping levers, enabling all units to be tripped at once.

Robbins & Myers Differential Chain Hoist

The three features of the differential chain hoist announced by Robbins & Myers, Inc., Springfield, Ohio, are Timken thrust bearings on the lower hook to permit easy turning of the load in addition to reducing the chain and upper sheave wheel wear caused by the chain twisting, sheaves of an alloyed iron of high strength and unusual hardness, and aluminum finish throughout except on the chain. The chain is a special analysis steel, heat-treated and electrically welded. The hooks are forged steel, heat-treated, and swivel freely, while the frames are of heavy malleable iron, of high tensile strength.

The hoist is manufactured in five sizes, in capacities from ¼ to 2 tons, inclusive. The regular lifts range from 6 ft. for the ¼-ton size to 9 ft. for the 2-ton size, the largest model



Robbins & Myers Differential Chain Hoist which is available in ¼- to 2-ton sizes

"New Rockford" No. 5 Double-Crank Press

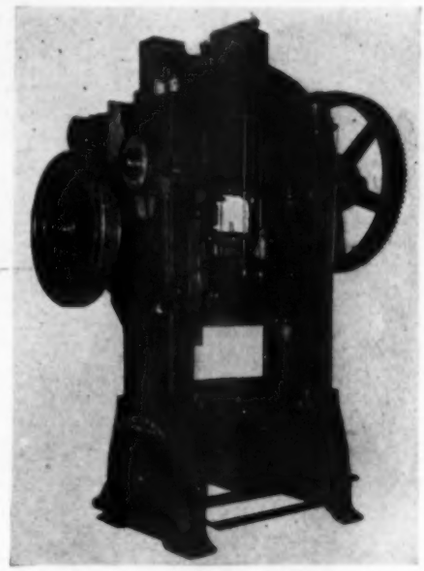
ANOTHER unit in the series of redesigned presses recently described in these pages is the No. 5 double-crank press made by the Rockford Iron Works, Rockford, Ill. The same principles of design as incorporated in other presses made by the company are seen in this machine. The castings are made of semi-steel and the uprights are keyed and bolted to the base. Steel tie-rods are also featured.

In the particular model shown, an eccentric shaft is used to drive the slides, but crank construction may also be obtained. A lever and ratchet in conjunction with bevel gears is used to adjust the slide so that each connection piece is lengthened the same amount. As can be seen in the illustration, spring counter balance is used on the slide.

Suitable pads are provided on the back of the press for mounting a motor for drive, if desired, but a belt-driven flywheel can also be obtained. The press is single geared with a ratio of 7 to 1, and a three-jaw clutch controls the movement of the eccentric or crankshaft. Control is by a treadle across the front of the press with a guard placed above it for safety. On the outboard end of the crankshaft is a band brake, which can be adjusted by hand from the floor. The crankshaft bearings and the crankpins are bronzed bushed, but the drive shaft is mounted on Timken bearings. At the flywheel end, two bearings are mounted opposed in a unit carrier, and at the pinion end there is a Timken bearing each side of the pinion. In order to assure alignment, the housings are cast integral with a bridge that ties the entire structure together.

As in other models, the crankshaft is made of heat-treated steel and the gears and flywheels are cut of semi-steel. The crankshaft is 5 in. in diameter at the bearings and 7½ in. at the crankpins.

In the machine shown, the width between uprights is 44 in. and between gibs 39½ in. The slide itself measures 21 in. front to back and 39 in. wide, while the bolster measures 30x42 in. The opening in the bed is 15x28 in. and the die space 16½ in. from bed to slide with stroke down and adjustment up. The stroke of the press is 8 in. with an adjustment available of 3½ in. As a special feature, T-slots are provided in the



Front view of the "New Rockford" No. 5 Double-Crank Press

bolster which is 4½ in. in thickness. The speed of the press is 35 strokes per minute. The flywheel measures 45x7 in. and weighs 1,350 pounds.

"Kant Slip" Plier

Round, square, hexagon, and other shaped articles may be held securely in the "Kant Slip" plier announced by the Kant Slip Plier & Tool Company, 6036 Wentworth Ave., Chicago, Ill. As will be noted in the

"Kant Slip" Plier

accompanying illustration, a sliding fulcrum is produced by the back of the lower jaw sliding on and bearing against a fulcrum at the rear of the upper jaw. Wedging the lower jaw between the fulcrum and a cam-like surface causes pressure to be exerted on the article held. No pressure is exerted on the pin. Since the fulcrum

is always close to the load, considerable pressure may be obtained with a moderate grip. In fact, the plier can be used for screwing up pipe of suitable size when the pipe is laid in close quarters.

The Kant Slip plier is a drop-forged tool made of crome-vanadium steel, hardened clear through. The teeth are accurately machined and will not batter nor crumble. Handles are shaped to fit the hand.

"New Rockford" Crank and Eccentric Presses

A SERIES of completely redesigned crank and eccentric presses has been placed on the market by the Rockford Iron Works, Rockford, Ill. Capacities vary from 40 to 400 tons and the crankshaft diameters from 3 to 9 in. by half-inch steps. Fig. 1 illustrates a front view of the No. 407 size, capacity 175 tons, incorporating a hand-operated friction clutch. It is a crank type. Fig. 2, on the other hand, shows the No. 409 eccentric drive press, capacity 400 tons, with a jaw clutch. Either crank or eccentric shafts are optional, depending upon the type of service anticipated.

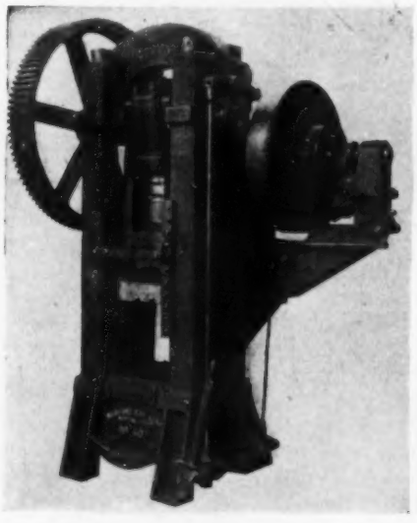


Fig. 1—Front view of the No. 407 "New Rockford" Press with friction clutch drive

Several features are common to the entire line. Steel tie-rod construction is used on all sizes and the castings are made of semi-steel throughout. Timken bearings are used on the drive shaft and bronze-bushed bearings at all other locations, including the crankshaft and crankpin positions. Gears and pinions are cut from steel, with the exception of the large crankshaft gear which is made of semi-steel unless specified otherwise. The crankshaft is a heat-treated steel forging, and the crankpin is in all cases one and one-half times the diameter of the crankshaft at the bearings. The connection piece is of semi-steel, and in the larger sizes the buttress-thread screw, made of heat-treated steel, engages a soft steel sleeve clamped in the connection piece. In the smaller sizes the screw engages a thread cut directly in the casting. Extra long gibs and slide are also featured.

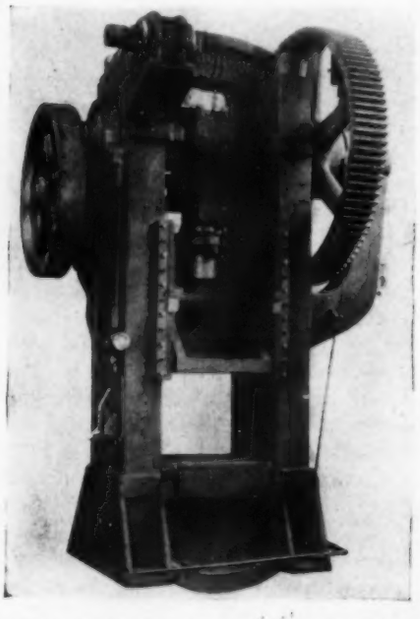


Fig. 2—Front view of the No. 409 Eccentric Drive Press with jaw clutch

With friction clutch drive, a compensating shoe-type brake is employed independent of the clutch. By means of a cam on the end of the crankshaft, the clutch is thrown and the brake applied automatically at the top of the stroke. This construction can be plainly seen in the front view, Fig. 1. Final pressure on the brake shoes is by toggle action. The brake drum itself is mounted integral with the clutch flywheel. With jaw-clutch drive, a band brake is used on a drum mounted on the end of the crankshaft. This brake may be adjusted from the floor by hand. In the design of the friction clutch drive presses, eight Timken bearings are used on the drive shaft; two support the flywheel when idling, and the other six are mounted in pairs at the two pedestal bearing locations and at the outboard bearing, which, as can be seen, is mounted on a substantial bracket. With the jaw-clutch design, four Timken bearings are used on the drive shaft.

Pressure grease fittings or unit lubricating systems are optional.

The specifications of the two sizes illustrated are typical of the entire line.

The particular press illustrated in Fig. 2 was designed with eccentric drive for blanking heavy stock, but it also can be obtained with crank drive.

SPECIFICATIONS

	407	409
Size	407	409
Capacity, tons	175	400
Crankshaft diam., in.	7	9
Pin diameter, in.	10½	13½
Flywheel size, in.	50x8	56x8
Flywheel weight, lb.	2,200	2,500
Flywheel speed, r.p.m.	380	300
Gear ratio	20:1	25:1
Strokes per min.	19	12
Bolster plate size, in.	28x28	36x36
Bolster plate thickness, in.	4	5
Distance between gibs, in.	23	29½
Die space, stroke down, adjustment up, in.	18	29
Adjustment, in.	4	5
Stroke, in.	10	2½ (ecc.)
Weight, lb.	44,000	60,500

Siewek Fixture Lock

For use in drilling fixtures, milling fixtures, vises, and special machinery, a fixture lock, shown in Fig. 1, has been placed on the market by the Siewek Tool Company, 10,232 Woodward Avenue, Detroit, Mich. Referring to Fig. 2, by rotating the handle *A* in the direction of the arrow, motion is imparted to the cam ring *C* to which it is attached. This in turn, by virtue of its eccentricity and the spring *G*, causes cam *D* to rotate shaft *E*. When motion of the shaft

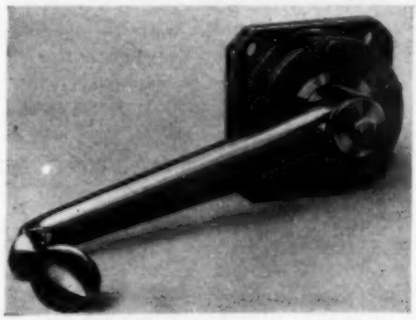


Fig. 1—Siewek Fixture Lock which may be applied to drilling fixtures, milling fixtures, vises, and special machinery

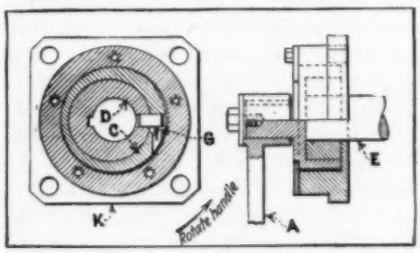


Fig. 2—Cross-section and end view showing the construction of the Siewek Fixture Lock

E ceases, because of the resistance from clamping the work, cam *D* also becomes stationary, but handle *A* and cam ring *C* being still free to rotate, become locked by wedging between the cam *D* and the housing *K*, at the same time compressing spring *G*. Movement of the cam *D* and the shaft *E* is then impossible owing to the wedge action of the cam ring *C*. To release, the handle *A* is rotated in the opposite direction, whereupon spring *G* centralizes the cams and shaft *E* is free to be rotated in the opposite direction.

"U. S." Grinder with Gibbs V-Disk Transmission

A Gibbs V-disk transmission is employed in the grinder, illustrated, which has been developed by the United States Electrical Tool Company, Cincinnati, Ohio. The disks used in the transmission, shown in Fig. 2, are of graphite-impregnated micarta and are durable, accessible and low in replacement cost. They are suitable for operation at 9,000 ft. per min., the accepted speed for high-speed snagging.

Two changes of spindle speed are available during the life of the grinding wheels in order that they may be run at nearly 9,000 ft. per min. These changes are made in only a few seconds by means of the foot pedal and hand lever conveniently located on the front of the machine. Depression of the foot pedal disengages the transmission and the hand lever slides the spindle disks along the shaft until the smaller step is engaged. The hand lever is interlocked with the guards, making it impossible to run the wheels at excessive rates of speed. On the grinder that takes a 24-in. wheel, for example, the wheel surface speed is 9,500 ft. per min. When worn down to 21 in., the speed is 8,500 ft. per min. Then the spindle speed is increased to give 9,500 surface ft. per min. By the time the wheel is worn down to 18 in. in diameter, it is turning at 8,300 surface ft. per min. At this point, the spindle speed is increased a second time, giving approximately 9,700 ft. per min. By the time the wheel is worn down to the flanges, the surface speed is about 8,000 ft. per min. The grinder is regularly made to carry wheels 18x2, 20x2, 24x3, and 30x3 in. in diameter.

The grinder is built in accordance with the safety code of American Engineering Standards Committee and the motor is built to the A. I. E. E. standards, and rated for continuous service with a temperature rise of 40 deg. C. The spindle is mounted on four heavy-duty SKF ball bearings inclosed in dust-proof housings. Push-button control, no-voltage release, and overload protection are supplied. Other features are the glass eye-shields, adjustable toolrests, and electric steel or boiler plate wheel guards of the adjustable type with exhaust connections. The machine is available for operation on 220-, 440- and 550-volts; 25-, 30-, 40-, 50- and 60-cycle, 2- or 3-phase a.c. circuits.

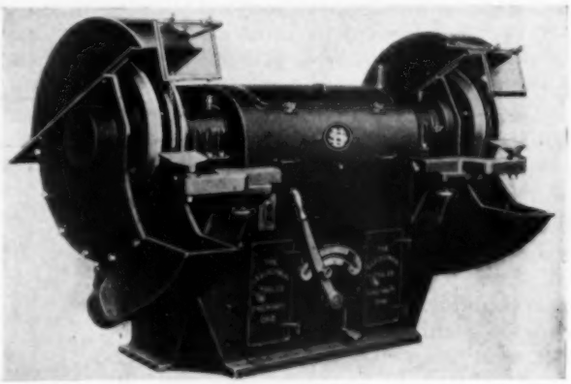


Fig. 1—"U. S." Grinder with Gibbs V-Disk Transmission

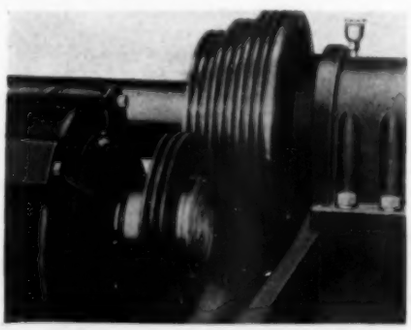
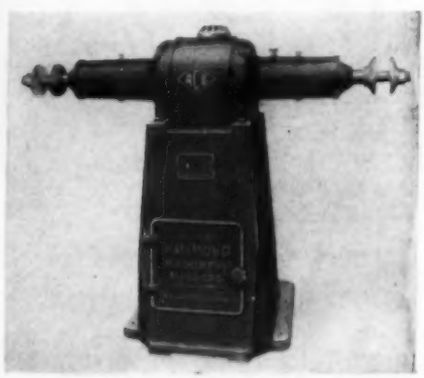


Fig. 2—Two speed changes are provided for in the Gibbs V-Disk Transmission on the "U. S." Adjustable-Speed Grinder

Hammond Heavy-Duty Polishing and Buffing Lathe

Available in sizes from 3 to 15 hp. inclusive, the heavy-duty, four-bearing, electrically-driven, polishing and buffing lathe has been placed in the market by Hammond Machinery Builders' Inc., formerly the Hill-Curtis Company, Kalamazoo, Mich. The motor supplied is especially designed for grinding service. It is totally inclosed, having no holes nor open slots for ventilation. Clean air is supplied to the motor through an "Air-Clean" filter. The motor will



Hammond Heavy-Duty, Motor-Driven Polishing and Buffing Lathe

withstand a momentary overload of 100 per cent beyond its rated capacity. Push-button control is conveniently mounted on the front of the pedestal, with a Cutler-Hammer automatic motor starter having thermal overload protection and low-voltage protection mounted on the door of the pedestal.

Four oversize ball bearings support the one-piece, chrome-manganese steel spindle. The bearings are equipped with a convenient oil cup, oil level gage and flushing plug. Double labyrinth seals with an overflow gage prevent dirt and dust entering the bearing compartment, and the oil overflow protects against surplus lubricant entering the motor compartment. The flat top spindle thread and spindle lock are standard.

These polishing and buffing lathes are regularly supplied for 220- 440- and 550-volt, 25-, 50- and 60-cycle two- and three-phase a.c. circuits. Direct current models are also available. The machines are furnished in 3-, 5-, 7½-, 10- and 15-hp. sizes in the four-bearing model, whereas the two-bearing machine is supplied in 1½-, 2-, 3- and 5-hp. sizes.

Pollard Welded Die and Tool Truck

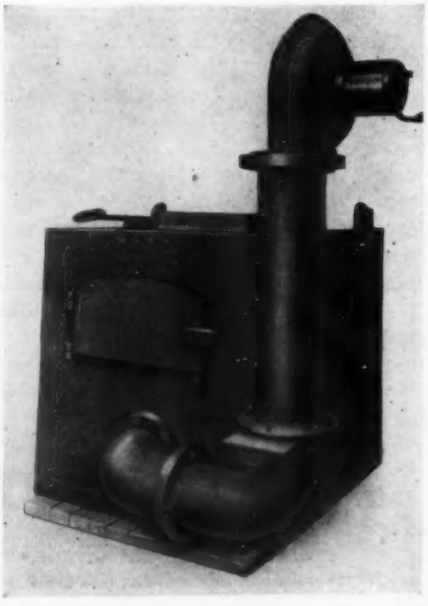
A die and tool truck with a capacity of 2,000 lb. has been placed on the market by the Pollard Bros. Manufacturing Company, 4043 N. Tripp Ave., Chicago, Ill. The truck is braced in all directions and is constructed by means of electric arc welding. The top plate is also braced underneath. Note that three edges are turned up. These turned up edges prevent any possibility of the dies or tools sliding off the truck. The total height of the truck is 35 in., being about the standard height of the bolster plate of the majority of punch presses.

Pollard Welded Die and Tool Truck

The casters used have 5-in. semi-steel, turned wheels with roller bearings. The housing or forks are of steel. Trucks can be furnished with four swivel casters or with two stationary and two swivel casters. They are made in four standard sizes.

Young Brothers' Coke-Fired Core Oven Heaters

UNIFORMITY of heat distribution and production of 113 to 154 lb. of molds per lb. of coke can be obtained by the use of the oven illustrated in connection with a foundry core and mold drying oven. The apparatus has been developed and placed on the market by the Young Brothers Company, 6,500 Mack Ave., Detroit, Mich. The unit heater is a small, box-type, self contained furnace built of fire brick and encased in cast iron. Instead of being located directly beneath the oven, it is placed adjacent to the rear or side wall of the oven and on the floor level.



Young Brothers' Coke-Fired Core Oven Heater

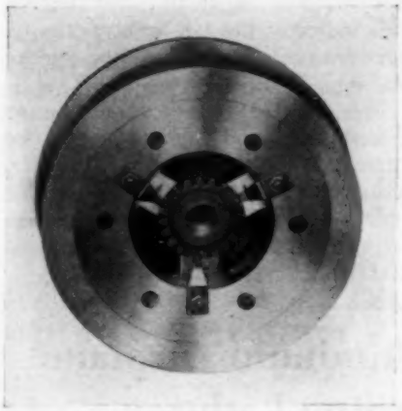
Instead of depending entirely on natural draught or on suction from a fan in the oven exhaust, the unit heater is supplied by a blower installed in its air intake line. Thus, the oven baking chamber instead of being at atmospheric pressure or slightly below atmospheric pressure, as under natural draft or when the fan is placed in the exhaust line, is under a positive pressure. The low-pressure fan used with the unit heater handles air at room temperature and consequently is not subject to bearing lubrication troubles. Because of the slight pressure maintained in the baking chamber and the positive circulation, the unit heater gives uniform heat distribution.

It is not necessary to use any given grade of fuel, nor is it necessary to use coke of any given size. In fact, breeze or fine coke, which is often wasted from the cupola, may be used in this heater just as well as the larger size of fuel. The unit heater is also adapted to oil and other types of fuel. The baking temperature of 750 deg. F. is reached in 2½ hours after firing.

The unit heater is built in three standard sizes designated as the Nos. 2, 3, and 4. The No. 2 will handle ovens having a baking chamber of 2,500 cu.ft. or less. The No. 3 heater is built to handle up to 5,000 cu.ft. of oven volume and the No. 4 will handle up to 6,500 cu.ft. of oven capacity.

Bolender Gear Grinding Chuck

Concentricity of the bore and the pitch line of the teeth may be obtained when grinding gear bores in the Bolender chuck illustrated. The chuck has been placed in the market by the City Machine & Tool Works, 1517-31 East Third St., Dayton, Ohio. It is available for either power or hand operation in two sizes, as follows: The No. 1 accepts 20 tooth 6-8 pitch gears and smaller, whereas the No. 2 accepts 31 tooth, 6-8 pitch to 20 tooth 6-8 pitch gears. Special chucks are manufactured to meet



Bolender Gear Grinding Chuck

unusual conditions. All working parts are hardened and ground and entirely inclosed.

The Bolender chuck is completely lubricated through one Zerk oiler. Work is loaded quickly from the front without adapters. Through the use of quick-change special chuck jaws, all types of irregular work can be handled. It is satisfactory on grinding the bores of bushings concentric with the previously machined outside diameter. Only the minor expense of regrinding jaws and replacing pins need occur.

Breuer "Tornado" Portable Electric Paint Sprayer

A compressor-type paint spraying machine has been placed on the market by the Breuer Electric Manufacturing Company, 852 Blackhawk St., Chicago, Ill. It is designed for touch-up work, shading, light finishing and refinishing jobs, as well as semi-production and maintenance industrial painting work. The unit is powered by a ½-hp. universal motor and develops a pressure of over 35 lb. per sq.in. The compressor unit weighs 7 pounds.

Breuer "Tornado" Portable Electric Paint

The "Tornado" spray gun is equipped with two tips, one slotted for fan spray and the other for narrow spray covering an arc of 2 to 14 in. An adjusting screw controls the amount of paint to be used. The gun weighs 2 lb. The Tornado paint spraying outfit complete consists of a quart container, two tips, 20 ft. of reinforced, rubber-covered cord, and 8 ft. of rubber web-covered connecting hose.

Sundstrand Brake-Drum "Stub" Lathe

AN EASILY operated high-production "Stub" lathe for turning automobile brake drums after they have been attached to the wheels has been developed by the Sundstrand Machine Tool Company, Rockford, Ill. The bed of the standard Stub lathe has been retained, the carriage feed reversed, and the spindle lengthened so that the wheel and drum overhang the right-hand end of the bed. Both front and rear tool carriages may be provided for roughing and finishing cuts, but, when one operation suffices, the rear slide may be omitted. When the rear tool carriage is furnished, it is provided with longitudinal travel. Unmounted drums may be turned readily. Any desired method may be used for supporting and driving the work. The general practice is to employ an air-operated working holding device, which is furnished at extra cost on specification. The twelve spindle-speed and ten feed-changes are secured through pick-off gears.

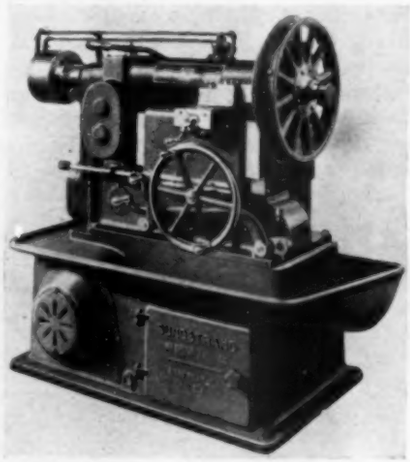


Fig. 1—Sundstrand Brake-Drum "Stub" Lathe developed for turning automobile brake drums after they have been attached to the wheels. Unmounted drums may be turned readily, however

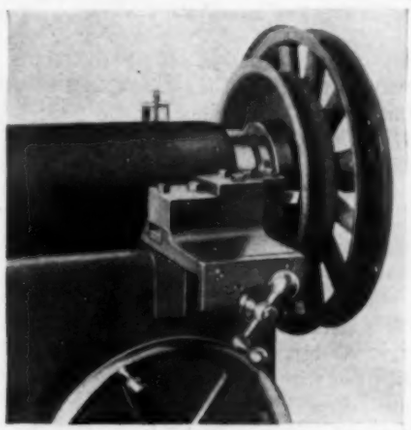


Fig. 2—Front tool carriage used for roughing. A similar tool carriage may be used at the rear for finishing

SPECIFICATIONS

Spindle nose diameter, in.	5.750
Hole through spindle, in.	1⅞
Taper hole in spindle, large end, in.	2.531
Range of spindle speeds, r.p.m.	40 to 65
Range of feeds, in.	0.005 to 0.046
Longitudinal travel of front carrige, in.	6
Longitudinal travel of rear carriage, in.	6
Transverse adjustment of front and rear tools, in.	3⅛ to 6½
Longitudinal adjustment of rear carriage, in.	1½
Motor recommended, hp.	5 to 7½
Distance from floor to center of spindle, in.	45
Floor space, in.	60x45½
Net weight, without motor, lb.	3,100

"Weldite" Type S Welding Rod

For welding chrome and chrome-nickel alloy steels, the type S welding rod has been developed by the Fusion Welding Corporation, 103rd St. & Torrence Ave., Chicago, Ill. It is designed primarily for welding the air-quenching austenitic chrome-nickel alloy steels by either the metallic arc, "Carb-O-Flux," or oxy-acetylene processes. The metal is an alloy steel containing approximately 18 per cent chromium, 8 per cent nickel, and is quite low in carbon. It

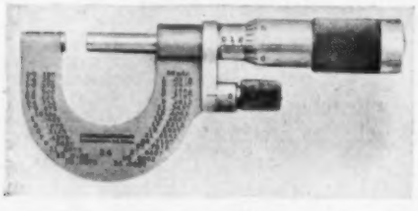
is available as a special flux coated metallic arc electrode for welding No. 14 gage and heavier and as a Carb-O-Flux welding rod for No. 14 gage and lighter material. It is also available as a bare welding rod for oxy-acetylene welding of No. 16 gage and heavier.

Weldite Type S metal remains austenitic, regardless of the rate of cooling, and the physical properties may only be changed by cold working or by annealing. It is essentially non-magnetic and therefore suitable for certain electrical equipment, such as transformers. It does not tarnish in air and is highly resistant to a long list of corrosive media, and also resists scaling up to a temperature of about 1,800 deg. F. The welding speed is about the same as that on steel using the same amount of heat. Type S metal has somewhat higher electrical resistance than mild steel.

Physical properties of the type S metal are, when severely cold worked, ultimate tensile strength, 157,000 lbs. per sq.in., yield point of 153,000 lbs. per sq.in., elongation in 2 in. of 18 per cent and Brinell hardness of 250; when annealed, it has an ultimate strength of 82,000 lbs. per sq.in., yield point, 38,000 lbs. per sq.in., elongation in 2 in. of 67 per cent and Brinell hardness of 135.

Brown & Sharpe No. 24 Micrometer Caliper

Measurements to ten-thousandths of an inch can be made by the No. 24 micrometer caliper announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. This tool, which has a range of 0 to 1 in. reads ten-thousandths directly. As usual, the thousandths are read from the barrel and the thimble and the readings in ten thousandths are read directly from a smaller lower thimble. The widely spaced graduations on this small thimble permit parts of ten thousandths to be estimated.



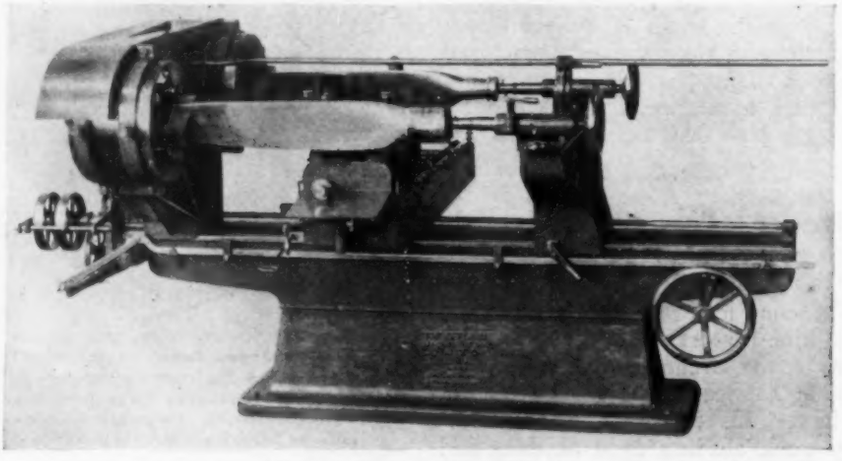
Browne & Sharpe No. 24 Micrometer Caliper which will measure directly to ten-thousandths of an inch

This micrometer caliper is used and operated in much the same way as the conventional 1-in. micrometer. After the spindle has been brought up to the object to be measured, the small lower thimble is turned until the horizontal line on the barrel of the micrometer coincides with a graduation on the main thimble. The graduation of the small lower thimble then indicates the ten thousandths of an inch to be added to the thousandths reading.

The No. 24 caliper is of simple construction, and has no gears nor intricate parts to get out of order. It has a solid anvil, and its thimble makes easy the adjustment to compensate for wear on the measuring surfaces.

Defiance No. 613 Aluminum Airplane Propeller Turning Lathe

THE turning of the flat winding portion of aluminum-alloy propellers or wood blade propellers and struts can be done on the No. 613 propeller turning lathe announced by the Defiance Machine Works, Defiance, Ohio. The lengths handled are up to 5 ft. and widths or diameters up to 12 in. The machine is the latest adaptation of the company's copying lathe, which will produce exact facsimiles of the models used, producing both right- and left-hand pieces from the same model, and, by a simple adjustment of the machine, either end of the work or the entire piece can be made larger or smaller than the model to suit requirements.



Defiance No. 613 Aluminum Airplane Propeller Turning Lathe

The feed mechanism that controls the cutter head carriage feeds from right to left or alternately from left to right or can be used to feed in one direction only. It has five changes of feed from $\frac{1}{8}$ in. to $\frac{3}{8}$ in., varying by $\frac{1}{16}$ in. It can be started or stopped instantly in any position of the cut. At the lowest rate of feed it will turn $2\frac{1}{2}$ in. per minute and at the fastest rate, 13 in. per minute.

When turning aluminum alloy, a 12-in. diam., $1\frac{3}{8}$-in. circle-nose, special, tooth milling cutter is used, which is mounted on a sliding frame and supported by a substantial carriage that travels across the path of the material to be turned by means of a heavy feed screw driven by double friction pulleys. These pulleys are operated by a convenient hand lever for starting the feed, which is disengaged automatically when the end of the cut is reached. A hollow chuck is supplied on both the pattern and the turning sides of the machine for holding the single-blade propellers and driving them. At the tailstock end, the propeller is held in a center provided with ball bearing thrusts.

The machine as regulary furnished is supplied with one milling cutter with tracing roll to suit and with

necessary oil cups and wrenches. The countershaft furnished is $2\frac{3}{16}$ in. x 13 ft. long and has three Hyatt roller-bearing-equipped drop hangers, with rack and pinion belt shifting apparatus, one two-step cone pulley, 4 x 6 in. x $2\frac{1}{8}$ in. face, one sectional drum for driving cutterheads, 16 x 77 in. feed pulley, 3 x 2 in., and tight and loose pulleys, 12 x 4 in., running at a speed of 600 r.p.m. The floor space occupied is 120 x 76 in. and the net weight is 4,260 pounds.

"Tubular" Automatic Rivet-Setting Machines

Feeding, inserting, and setting small split rivets automatically can be done on a rivet-setting machine manufactured by the Tubular Rivet & Stud Company, 87 Lincoln St., Boston, Mass. These machines have been found suitable for assembly operations on radio sets and similar work. Power is supplied by a self-contained motor which can be plugged into any available lamp socket. The machine runs at a speed of 200 rivets per minute, which is above the number of operations that is possible. It is stated

"Tubular" Automatic Rivet-Setting Machine which is made with various gaps

by the manufacturer that radio manufacturers have speeded up the assembly of their sets from five to eight times by the use of the machine.

Bliss No. 630 High-Production Press

CERTAIN improvements enabled the No. 630 high-production press to be operated at 400 strokes per minute on test, according to the E. W. Bliss Company, 53rd St., & Second Ave., Brooklyn, N. Y. This speed was maintained in the quantity blanking and forming of stampings from 0.010-in. brass and 0.014-in. steel coil stock. The No. 630 conservatively rated at 300 s.p.m., was erected on a wood block floor and though not bolted down or anchored in any way, ran through the test at this high rate of 20 pieces every three seconds very quietly and without vibration or jar. This machine is the regular 30-ton member of the company's line.

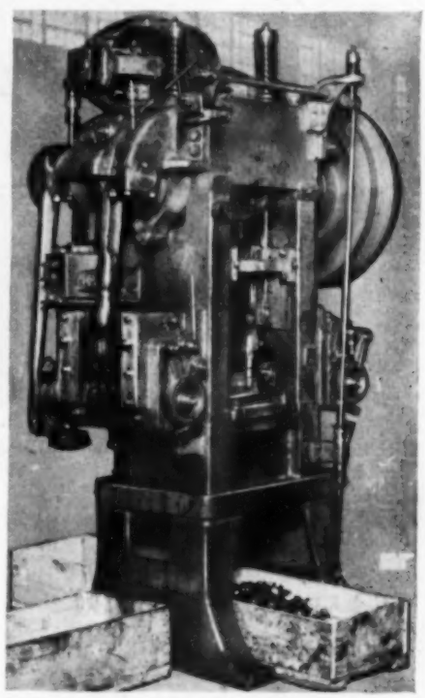
Extra-Heavy Construction

To obtain maximum life of the dies on high production, the machine has been built 50 per cent stronger than normal for presses of the same capacity rating. The parts strengthened include the bed, bolster plate, and crown. The heavy, built-up and keyed-in members are held by large shrunk-in tie rods placed under an initial tension greater than any load to be encountered in service. The stroke is short and all moving parts are compact. The chunky slide, the large buttress screw thread in the slide, and the solid, one-piece connection have been designed to take the high compression load. It is claimed that all bending stresses are fully absorbed in the deep bed and crown, and thus the life of the dies is materially lengthened by the elimination of the deflection.

Other improvements have been made in the high-production, double-roll feed. The hardened and ground hollow steel rolls are controlled by large size air brakes, and the independent roll relief and feed stroke adjustments permit very close settings. A scrap cutter is generally used with this machine and is ordinarily fitted with "Neor" steel blades when used to cut silicon steel and other hard scrap.

Die changing time has been reduced to a minimum. Die sets are recommended for convenience in setting up the dies, but actually they are unnecessary in operation as the "Tripod" (three-point) gibbing maintains the accuracy of alignment even better than closely fitted guide pins, it is claimed. An added convenience to the die setter is the reduction of the number of different adjusting bolt heads to two sizes, so that the whole set-up can be made with only two wrenches.

Other improved features include the hardened, chrome-nickel steel,



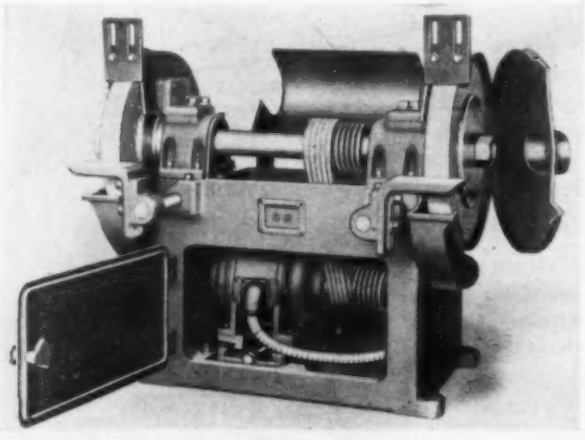
Bliss Improved No. 630 High-Speed Press in the 30-ton size which operates at 400 strokes per minute

rolling key clutch with backing pawl, Manzell force-feed lubricator with separate piping to all main bearings, ample counter-balancing springs on the slide, and a Texrope drive on the top of the press. All parts are up out of the way, leaving a maximum of clear floor space for tote boxes and aisles, as will be noted in the accompanying illustration.

The extra-large opening under the bed facilitates the use of such attachments as chutes and stackers. For cleanliness the main bearings are oil trapped and fitted with drip pans from which the oil is piped to the oil sump which is located in the bed of the press.

Hisey-Wolf "Multi-Speed" Grinder

Correct grinding wheel speeds for high-speed snagging are always maintained on the Texrope-driven grinder announced by the Hisey-Wolf Machine Company, Cincinnati, Ohio. This "Multi-Speed" machine is equipped with a 10-hp. motor designed to drive 24-in. grinding wheels at 9,500 s.f.p.m. When the wheels are worn to 20 in. in diameter, the spindle speed is increased to 1,800 r.p.m. by moving the wheel guards back so that the Texrope belts can be transferred to the smaller spindle pulley. The machine is then operated at this spindle speed until the wheel is worn as close to the flange as is practical. The combination speed change and safety device, which interlocks with the wheel guards, makes certain that the speed of the grinding wheels will not drop below 7,500 s.f.p.m. or be increased beyond 9,500 s.f.p.m., the maximum safe speed.



Hisey-Wolf "Multi-Speed" Grinder equipped with Texrope drive offering two wheel speed changes

As it will be noted in the accompanying illustration, the motor has a dovetailed sliding base and is moved forward and backward by means of a leadscrew to secure the proper belt tension and accurate alignment of the motor. The motor starter is encased in a steel cabinet, which is mounted inside the column, and a push-button station is conveniently mounted in the top front of the column. The wheel guards are of heavy boiler plate and they are built to conform to specifications recommended by the A.E.S.C. These guards are supported at the top and sides and are very rigid. Easy changing of the wheels is facilitated by the hinged guard doors.

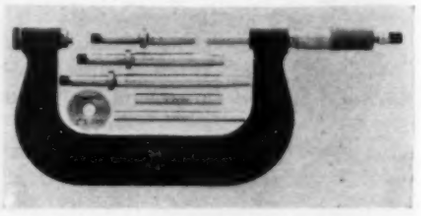
The bearing boxes are keyed to the column, insuring alignment, and the spindle and bearing housings are assembled as a unit. A change of belts may be made quickly and easily. Heat-treated, chrome-nickle steel is used for the spindle, which runs in oversize ball bearings at each end. Timken roller bearings are optional equipment without extra charge. A heavy steel chip breaker is mounted on each wheel guard and is readily adjustable to the wear of the wheel. Sturdy steel toolrests provide ample support when grinding heavy or bulky pieces. The machine has the spindle mounted forward of the center, giving ample foot room for the operator, providing for the easy handling of large castings.

The machines are furnished for standard motor specifications of 220 and 440 volts, 50 or 60 cycles and 2 or 3 phase circuits. They carry 24x3x12-in. wheels, the distance between the wheel centers being 45½ in. The height from the bottom of the base to the center of the spindle is 34½ in. Net weight is 2,525 pounds.

A single-speed machine, built in three sizes, is also available. The wheels carried are 24, 20, and 18 in. in diameter, respectively. Spindle speeds are 1,550, 1,800, and 2,000 r.p.m., respectively.

Brown & Sharpe No. 54 Micrometer Caliper

A wide range of measurement is found in the No. 54 micrometer caliper announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. This tool is especially adapted for use in the automotive service shop where its range of 0 to 4 in. by thousandths includes practically all automobile parts requiring close measurement. Pistons, camshaft bearings, wrist pins, crank shaft bearings and pins, and many other parts are measured quickly and accurately by its use. The measurements are obtained through the use of four interchangeable anvils of different lengths. The tool is available with or without ratchet stops and with and without standards.

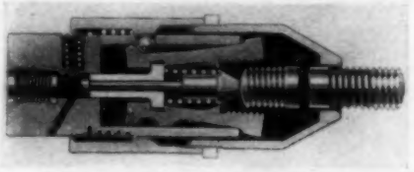


Brown and Sharpe No. 54 Micrometer Caliper which measures from 0 to 4 in. by thousandths

Titan Quick-Release Stud Setter

This self-opening stud setter has been placed on the market by the Titan Tool Company, Erie, Pa. It is a power-driven unit adaptable to drill presses of all types, and air and electric drills, both portable and stationary. It will work efficiently at either high or low speeds and at any angle. Although positively driven, the studs are released automatically when driven to a predetermined distance, and they are free from burred threads.

In operation, the tool may be registered or loaded by clamping onto studs previously started into the tapped holes by hand or by inserting the studs in the tool. The positive drive is released when the gage sleeve pushes back the slip ring, which in turn releases the hardened steel driving balls. These balls move outwardly into a recess provided in the slip ring. It will be noted, however, that at this stage the driving jaws remain in complete register with the stud and to further complete the cycle of operation it is only necessary to lift or pull away the tool from



Titan Quick-Release Stud Setter

the stud. This is done with complete freedom from burring the thread.

As the tool frees from the stud, the slip ring acts on the driving balls, forcing them into the driving position. The jaws then come out into an open position and the unit is ready to register and drive another stud. The jaws are arranged in the tool body in such a manner as to fit closely over the stud even where the studs may vary as much as 0.015 in. in pitch diameter. This arrangement also insures longer service for the jaws.

Studs as short as $\frac{1}{2}$ in. may be seated successfully with this tool. It is made in two sizes having maximum capacities of $\frac{1}{2}$ and $\frac{7}{8}$ in., respectively.

Whitney No. 17 Punch and No. 49 Notcher

Two shop devices, the No. 17 punch and the No. 49 notcher, have been placed on the market by the Whitney Metal Tool Company, Rockford, Ill. The No. 17 punch is a roller-bearing bench type with capacity to punch $\frac{1}{4}$-in. holes through $\frac{1}{4}$-in. iron and has a total depth of $6\frac{1}{4}$ in., making possible the punching in the center of a $12\frac{1}{2}$ in. circle. This punch is furnished with or without a work table.

The No. 49 notcher is of ball-bearing spindle construction, reducing

Fig. 1—Whitney No. 17 Roller Bearing Punch

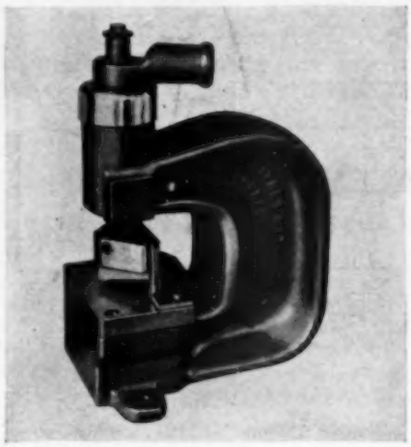
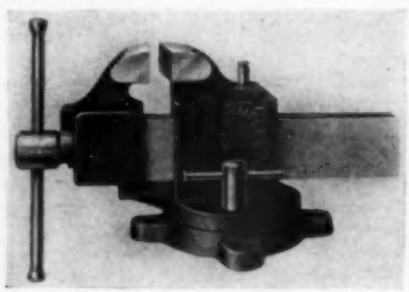


Fig. 2—No. 49 Whitney Notcher

friction to a minimum and allowing full leverage in notching sheet metal or angle iron. The notcher is equipped as standard with a 90-deg. punch and die and will notch $1\frac{1}{2}$ in. deep in sheet metal or angle iron $\frac{3}{16}$ in. thick. This machine is equipped with a depth gage so that a notch can be cut to any depth up to and including $1\frac{1}{2}$ inches.

"Simplex" Swivel Backjaw Vise

The back part of the vise illustrated is made in two parts, the top part of which swivels, making it possible to hold irregularly shaped pieces. This



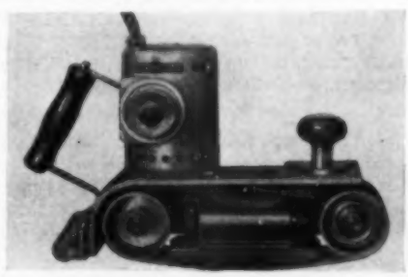
"Simplex" Swivel Backjaw Vise

top part is provided with a pin which locks it to the back jaw when the swivel feature is not desired. The vise has been placed on the market by the Simplex Tool Company, Woonsocket, Rhode Island.

In common with the rest of the vises manufactured by the company, this vise is made with steel slide. That is, the sliding member of the front jaw is machined out of a solid bar of steel, making this part unbreakable. It has a special type nut into which the operating screw is inserted. The nut is so designed that it cannot lift up at the back and bind the screw and thereby limit the gripping power and make both the screw and the nut susceptible to breakage. Other features are the outside screw retainer and removable jaw inserts, which are doweled as well as screwed on.

Porter-Cable Type B-7 "Take-About" Sander

High belt speed of 1,800 ft. per min. on this "Take-About" portable sander makes it especially suitable for finishing, grinding and polishing on body and metal work. As the belt moves in a straight line, it leaves no cross scratches and secures a high degree of finish. The machine is also suitable for surfacing wood products.



Porter-Cable Type B-7 "Take-About" Sander

It has been placed on the market by the Porter-Cable Machine Company, Syracuse, New York.

A $1\frac{1}{2}$-hp., 180-cycle motor is used to drive the belt on the Take-About sander at a maximum motor speed of 10,800 r.p.m. The use of 180-cycle current has permitted a reduction in motor size to about one-third that necessary when operating on 60 cycles and the material reduction in weight has permitted greatly increased strength of the gears, bearings, and other mechanical parts. The rotor of this motor cannot burn out and has no commutator or brushes. Among its advantages are more power, more torque, tapered collars for prevention of dirt accumulation, and resistance to damage by heat. The worm gear used is hardened and ground to withstand the high speed of operation.

The belt, 3x25$\frac{3}{4}$ in., travels at 1,800

ft. per min. The diameter of the pulleys employed is 2¾ in. Equipment includes six belts, ½-in. felt covered shoe, and 20 feet of rubber-covered, four-conductor cable without plug. Overall dimensions are: Height 9 in.; width 6 in.; length 15 in., and the weight is 21 pounds.

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal-Working Machines

The combination, in a riveting machine, of a work-holder comprising a longitudinal sheath having openings through opposite walls for use in co-operation with die members and a hammer is covered by patent 1,729,247 granted to Anton Grothus, Hoboken, New Jersey.

A collapsible tube-making machine, having an extruding mechanism, means for feeding a blank to a spindle, and other co-operating parts, is the subject of patent 1,729,257 assigned to the Atlas Collapsible Tube Company.

To the International Stamping Co. has been assigned patent 1,729,324 on a high-speed reciprocating saw, with a tube reciprocable in a bearing, said tube having means for retaining a cutting element, and other co-operating parts.

A metal-rolling mill having a pair of rolls, back-up rolls adjacent thereto, a yieldable element in contact with the bearings, and a wedge-shaped member movable between the yieldable portion, is covered by patent 1,729,410, assigned to the Laclede Steel Company.

Processes

The process of substantially preventing the solution of iron and steel articles in a pickling bath by adding thereto a soluble inhibitor containing phosphorus and sulfur, is the subject of patent 1,729,097, assigned to Peter C. Reilly of Indianapolis, Indiana.

The Metropolitan Engineering Co. is assignee of patent 1,729,180 on a method of making hollow articles by successively butt-welding formed pieces to a continuous piece.

The subject of patent 1,729,208, assigned to the Electro Metallurgical Co., relates to the process of changing the physical characteristics of copper-base alloys containing silicon by heat-treating at temperatures from 500 to 800 deg. C., and thereafter quenching.

That method of making a cam which consists in drawing a cup of sheet-metal, subjecting same to edgewise pressure and forming the same in a die, is the subject of patent 1,729,300, assigned to the North East Electric Company.

The method of producing a rare refractory metal which consists in reducing a compound of the rare metal and simultaneously alloying therewith a proportion of zinc, is covered by patent 1,728,942, assigned to the Westinghouse Lamp Company.

To Thaddeus F. Baily, of Alliance, Ohio, has been granted patent 1,727,193 on the process of manufacturing ferro-silicon, which consists in reducing SiO_2 in the presence of carbon, separately melting iron in the presence of carbon and mixing known proportions of the two molten masses in predetermined quantities.

Furnaces

Patent 1,726,606, granted to Moses Appel, of Johnstown, Pa., covers a reversing furnace with gas and air ports at each end and deflectors arranged adjacent thereto with means for adjusting their position.

A bar-heating furnace is the subject of patent 1,727,097 granted to Frank W. Brooke, of Pittsburgh, Pa. It covers the combination of an inlet and outlet at opposite ends, a bar support above the floor, and space beneath said support communicating with a number of outlets.

Thaddeus F. Baily, Alliance, Ohio, has been granted patent 1,727,192 on an annealing apparatus comprising a number of hoods, a heating chamber, a duct connecting these members and means for controlling gas flow to each hood.

TRADE PUBLICATIONS

FOUNDRY OVENS. The Gehnrich Oven Co., Inc., Long Island City, N. Y., has published a bulletin on foundry ovens for core baking, mold drying, pasting, blacking, preheating, aging, and normalizing. Descriptions, photographs, illustrations and a plan view of a foundry, showing the location of these units, are given. The catalog contains sixteen 8½x11-in. pages.

PRESS BRAKES. The Cincinnati Shaper Co., Elam St. & Garrard Ave., Cincinnati, Ohio, has published a catalog illustrating and describing its complete line of press brakes and showing the various kinds of work that can be done on them. It gives complete specifications and recommended machine sizes for right-angle bends in different gages and lengths of mild steel.

SHAPE CUTTING MACHINES. The General Welding & Equipment Co., 70 Lansdowne St., Boston, Mass., has published a folder on "Modern Oxy-Gas Automatic Shape Cutting Machines," for fabrication and mass production. Descriptions are given of the various machines and photographs are shown of them in operation on many different types of work.

SHEET-METAL MACHINERY. The Niagara Machine & Tool Works, Buffalo, N. Y., has published a catalog showing its machines and tools for sheet metal working as applied to aircraft manufacture. It shows various types of punch presses, press brakes, forming machines, and other units.

SHOP EQUIPMENT, STEEL. The Standard Pressed Steel Co., Jenkintown, Pa., has published form 416 on standard and special "Hallowell" steel shop equipment, consisting of desks, benches, and locker-room equipment.

ACCIDENTS, INDUSTRIAL. The U. S. Department of Labor, Bureau of Labor Statistics, has issued bulletin No. 490 on "Statistics of Industrial Accidents in the United States to the end of 1927," which is offered as a basis for the promotion of safety in industry.

INDUSTRIAL DEVELOPMENT. The McGraw-Hill Publishing Co., Inc., Industrial Sites Service Bureau, 10th Ave. at 36th St., New York, N. Y., has published "A Master Survey for Community Industrial Development," which is the second of a series on the subject. It is an outline on what any community should know about itself before attempting to attract new industries. When the data as outlined are compiled, they should result in the complete analysis of the community's industrial status. The booklet contains 27, 9x6-in. pages.

LATHE OPERATION. The South Bend Lathe Works, 426 E. Madison St., South Bend, Ind., has published a new edition of its booklet, "How to Run a Lathe" in the Spanish language. It has been newly translated.

WELDING AIRPLANE FUSELAGES. The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has published a 12-page illustrated booklet, outlining the correct practice for the instruction of welding operators engaged in airplane manufacture. A second part of the booklet carries discussion on the welding of duralumin.

NEWS
OF THE WEEK

President Hoover Grasps the Helm

By Paul Wooton

Washington Correspondent, American Machinist

WITH characteristic boldness Herbert Hoover has moved swiftly to repair any damage done the business structure by the stock market crash. In an incredibly short time, he has mobilized railroads, industry, labor, and agriculture. These groups have it within their power to prevent any depression and already are moving effectually toward that objective. There is new evidence that the occupant of the White House is capable of coping with the forces unloosed by the crash of stock prices and of directing the movement necessary to protect legitimate business throughout the nation. His general strategy is to put all the groups mentioned on their mettle so that they will make sure that there is no surrendering to needless alarm.

All those who have been closeted with the President have made very definite promises. A month hence there will be a checking up to ascertain the degree of compliance with those promises. The President has furnished a rostrum from which contributions for the continuance of prosperity may be announced. The first speaker was Agnew T. Dice, president of the Philadelphia & Reading, who revealed that his company is entering upon a $20,000,000 program of electrification.

By the end of 1929, the railroads will have expended $800,000,000 for betterments. There is reason to believe that in response to the President's suggestion, the aggregate of betterment programs for 1930, to be reported a month hence at the Chicago meeting of the American Railroad Association, will be well in the neighborhood of $1,000,000,000.

Much importance is being attached at the conferences to the export trade. While it is recognized that foreign markets, at best, can be relied upon to take only a small percentage of domestic production, it is pointed out that the difference between profit and loss often is only a small percentage of the local business. By stimulating export trade, a far more important effect on an industry can be obtained than is indicated by the actual volume of goods moved.

This discussion of export trade also opens up the question of branch plants abroad, as has been pointed out by the *American Machinist*. In a situation like the present, American manufacturers now must decide whether or not they will operate foreign branches, thereby reducing the amount of work that will be available in their plants at home. Branch plants not only rob the United States of the business in the country where the branch is located, but other countries frequently are supplied from that source. As an example, the United States has practically lost its export trade to Latin America in tires and rubber footwear to American branch plants in Canada.

That the President's policy is taking hold is evidenced by reports that cancellation of orders in numerous instances have been revoked and the manufacturers instructed to ship the goods in compliance with the original order. The President's task is much simpler from the fact that credit is abundant and cheap. There is no price inflation or accumulation of inventories, with a few unimportant exceptions.

It is no secret that the White House conferences were staged primarily for the effect they would have on business executives and members of the boards of directors of corporations. They control enough buying power to make or break the situation. Since many men in those positions were hit personally in the crash of stocks, the world seems upside down to them. There is proof that their personal misfortune has been reflected in the policy of their companies. The result has been to sit back and to be cautious.

The public, at first inclined to accept statements that business would not be affected, soon noted this attitude on the part of corporations. As a result, there has been some lack of confidence. It is this feeling of alarm that the President is checking.

It is very clear that the President has no idea of setting up a superboard of strategy for the conduct of the country's business. The situation is much different than at the time of the President's Unemployment Conference in 1921. Since that time there has been a great improvement in the facilities for reaching business.

* * * *

Many Technical Activities Scheduled For A.S.M.E. Annual Meeting

Sessions on applied mechanics, materials handling, management, aeronautics, and machine-shop practice included

A WIDE VARIETY of technical activities are scheduled for the annual meeting of the A.S.M.E., which will be held in New York City from Dec. 2 to 6. Technical sessions, council meetings, business meetings, get-togethers, the annual dinner at the Hotel Astor, meetings of members from the same colleges, and a number of other events are included in the program.

A conference of local section delegates will be held on Sunday, Dec. 1, at 1 p.m. The meeting proper begins on Monday morning at 9:30 o'clock with a council meeting and simultaneous sessions on hydraulic power, applied mechanics, machine-shop practice, hydraulic turbines, and power test codes. Another conference of local sections delegates and a council meeting will be held in the afternoon. A business meeting, open house, and a ladies' get-together will be held in the evening.

Tuesday morning, following another conference of local delegates, simultaneous sessions will be held on fuels, materials handling, applied mechanics, economics of delivery vehicles, cutting metals—jointly with machine-shop practice, and mechanical springs. A report of the nominating committee, the introduction of the president-elect, and a reception and dance in the evening will follow the afternoon sessions.

Simultaneous sessions on the use of engineering literature, department management, and lubrication—jointly with machine-shop practice will be held on Wednesday morning. The afternoon will be given over to simultaneous sessions on education and training for the industries of non-college types, student branches, and steam tables research. The annual dinner and dance will be held on Wednesday evening at 6:30 o'clock, at the Hotel Astor.

Thursday morning, simultaneous sessions on production management, central-station power, railroads, and oil and gas power will be held. Further sessions on railroads, application of geometrical similarity and dimensional analysis in fluid flows, and a general session will be held in the afternoon,

together with a ladies' annual tea. The college reunions will be held that evening.

Following a council meeting on Friday morning there will be simultaneous sessions on boiler feedwater studies, aeronautics, textiles, rail-motor cars, refrigeration, and furniture production. This program will end the annual meeting.

Details of the meeting may be obtained by addressing Calvin W. Rice, secretary of the A.S.M.E., 29 West 39th St., New York City.

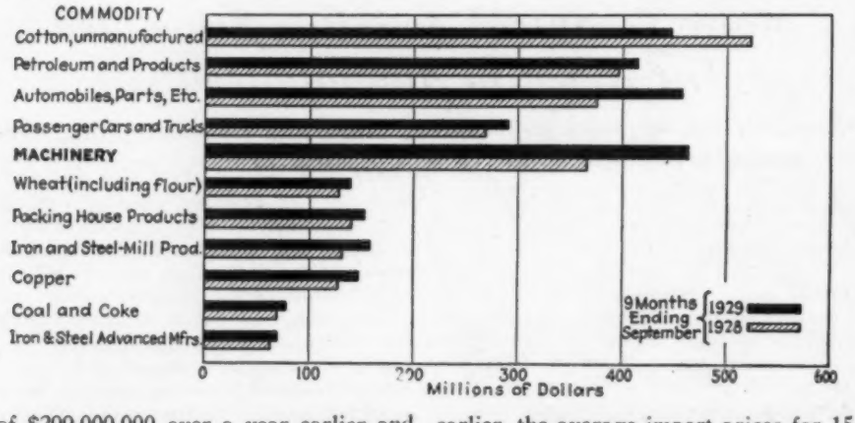
* * * *

Machinery Is First in U. S. Exports During First Nine Months of 1929

Manufactured Cotton Loses Lead in Commodities Exported—Automobile Parts and Equipment Assume Second Place

MACHINERY exports from the United States, totaling $462,500,000, increased 27 per cent during the first nine months of 1929 as compared with those of the same period in 1928, and assumed the lead in value of exports so long held by our manufactured cotton, according to the U. S. Department of Commerce. Automobile parts and equipment took second place with a value of $455,400,000, an increase of 22 per cent for the first nine months of 1929, as compared with the value of similar exports during the first nine months of 1928. Finished products of iron and steel increased by 17½ per cent. Other finished articles showing substantial increases in value include: rubber, gasoline, photographic goods cotton manufactures, paper and manufactures, chemicals, and manufactures of wood.

Total exports of finished manufactures for the nine-month period amounted to $1,967,000,000, which was an increase of $299,000,000 over a year earlier and more than double the exports of this group in the corresponding period of 1928. Exports of semi-manufactures totalling $558,000,000 increased $29,000,000 in consequence of larger foreign sales of iron and steel, naval stores, and lumber and a higher average unit value of copper. The growth of 18 per cent in exports of finished manufactured articles was largely responsible for an 8 per cent gain in the value of total exports and was perhaps the outstanding feature in export trade during the period. The foreign sales of this class of merchandise constituted 52 per cent of the total trade.



Imports totalled $3,360,000 in value, an increase of $290,000,000 over those of the same period a year earlier and were slightly greater than those for the first three quarters of 1926 (the previous high figure since 1920). The value of the imports exceeded that of the corresponding period of 1922 by 54 per cent and was more than 2½ times as large as that in the first nine months of 1913. Price reductions have greatly affected the total value of imports during the past few years. In comparing the first nine months of 1927 and 1928, both show declines in the aggregate value of goods imported solely as the result of lower prices. Imports of 1929 would have increased decidedly more than they did had prices not fallen still further. The quantities of imports were more than one-sixth greater than those of a year earlier and fully one-fifth larger than those in the corresponding period of 1926. As compared with the year earlier, the average import prices for 15 out of 21 leading commodities declned.

During the period the most important development in import trade was the expansion of $118,000,000 in the value of imports of semi-manufactures to a total of $676,000,000. This increase was a result, in large part, of greater purchases of copper and a higher average unit value. Imports of copper increased by one-third in quantity and the value amounted to $116,000,000 or 72 per cent more than those in the year earlier. The United States exports of leading commodities for the nine-month periods ended September, 1928, and 1929 are shown in the comparative table.

Ford Receives Exhibit From Westinghouse

Henry Ford, on his way to President Hoover's industrial conferences in Washington, stopped at the East Pittsburgh works of the Westinghouse Electric & Manufacturing Co., on Nov. 19, to see what is said to be one of the most complete exhibits in existence of pioneer electrical inventions. During his visit, Mr. Ford was presented the entire exhibit, which will be placed in the Ford Museum, a permanent industrial exhibit at Dearborn, Mich. The presentation was made by F. A. Merrick, president, and W. S. Rugg, vice-president, of the Westinghouse Company. Approximately 600 different articles comprise the exhibit, most of them being important inventions of the years between 1880 and 1890, and for the most part developed by Westinghouse engineers.

* * *

Standards Bureau Evolves New Test for Lathe Tools

A new and simple method for testing steels for lathe tools has been developed by the U. S. Bureau of Standards. This method of testing lathe tools to be used under shallow cuts and fine feeds is based upon the fact that when two tools are set at an equal depth in the same toolholder, the second, or trailing, tool will not cut until the leading, or test, tool begins to wear.

This method of test was first used in a study of the conditions of cutting, including variations in cutting speeds, feeds, depths of cut, and the presence or absence of cutting liquids. Tests were also made with tools of different forms and with tool steels of different compositions heat-treated in various ways. The tests were made throughout a period of about three years and included over 1,000 tools. The performance of carbon and low-alloy tool steels and chromium-tungsten-vanadium (high-speed) steels was studied by means of the new method of test and the results were compared with those obtained in the heavy-duty tests. It was found that composition variations which were beneficial for the one type of service were not necessarily so for the other.

Both the new test and the customary heavy-duty test were applied to high-speed steels containing additions of arsenic, antimony, copper, tin, cobalt, nickel, molybdenum, aluminum, titanium, tantalum, high phosphorus, and high sulphur. Of these 13 elements, only one, cobalt, produced decidedly beneficial results. Molybdenum and nickel offered promise under certain conditions, while the remainder either had a negligible effect or were definitely deleterious.

The extent of the experiments is claimed to justify the conclusion that the new method of test is a useful addition to those previously available for comparison of lathe tools under conditions approaching those of practical service.

Metal-working Firms Increase Earnings Approximately 35 Per Cent

By R. M. Davis

Statistical Editor, McGraw-Hill Publishing Company

EARNINGS reports which have been made available so far indicate that the high rate of general manufacturing activity which has prevailed since the opening of the year has been reflected in good earnings by the companies supplying equipment such as machinery, engines, tools, and pumps. The National City Bank in a tabulation finds that the combined net profits of 12 such companies show a gain of 21 per cent in the third quarter, and 35 per cent for the first nine-months period.

The excellent position of the metal-working industry during 1929 is indicated by a comparison of reports from some 600 companies covering all industries. The combined net profits of this group for the third quarter amounted to $1,142,302,000, as compared with $1,001,244,000 in the third quarter of 1928, or a 14 per cent gain as compared with 21 per cent for the companies in the machinery trade. For the first nine months, the same aggregation of companies had net profits of $3,223,620,000, as compared with $2,679,934,000 in the corresponding nine months of 1928, or a gain of 20 per cent as compared with a gain of 35 per cent.

The accompanying table gives the earnings per common share of some of the more outstanding companies in the metal-working industry since 1925, and an estimate, based on the latest reports, of the earnings per common share for 1929.

EARNINGS OF CORPORATIONS IN VARIOUS BRANCHES OF THE METAL-WORKING INDUSTRY

(Courtesy of the Standard Statistics Company)

Name of Company	Earnings per Common Share 1925	1926	1927	1928	Estimated 1929
Caterpillar Tractor Company	1*–2.74	1*–3.08	1–4.25	1–5.41	6.00
International Harvester Co	*–3.36	*–4.11	*–4.21	5.58	7.00
Massey-Harris Co., Ltd	*–1.16	*–2.38	2.69	2.13	3.00
Mnpls.-Moline P. Implmt. Co	†–0.60	†–1.45	†–1.93	†–3.56	4.00
Chrysler Corp	*–5.42	*–4.89	*–6.15	*–7.03	6.00
Fiat	4.32	4.01	3.02	4.16	4.00
Ford Motor Co. of Canada, Ltd., Cl. A	*4.38	*3.81	*0.12	*d–2.43	3.25
Ford Motor Co., Ltd	.....	†0.58	†0.37	.....	.....
General Motors Corp	*2.80	*4.11	*5.19	*6.14	5.75
Graham-Paige Motor Corp	.....	0.10	2d–4.83	0.47	1.25
Hudson Motor Car	*13.39	3–3.37	9.04	8.43	8.50
Hupp Motor Car Corp	*3.27	*3.02	*2.33	*7.54	3.00
Nash Motors Co	*5.57	*8.50	8.30	7.63	8.00
Packard Motor Car Co	*0.76	*1.05	*0.78	*1.45	1.80
Reo Motor Car Co	2.71	1.51	2.36	2.54	2.00
Studebaker Corp	8.55	6.67	6.09	7.16	8.00
Willys-Overland Co	*4.14	*0.22	*1.94	*1.81	1.50
General Electric Co	*5.19	6.14	6.41	7.15	9.50
Westinghouse E. & M. Co	4–5.96	4–6.81	4–6.60	4–8.78	10.00
Allis-Chalmers Mfg. Co	*2.19	*2.35	*2.50	*2.82	3.75
E. W. Bliss Co	.....	†3.33	0.63	2.38	.....
Bucyrus-Erie Co	†3.85	†4.84	†2.94	2.43	.....
Fairbanks-Morse and Co	6.74	6.03	3.09	4.52	5.00
Hart Carter Co	†1.08	†0.89	†1.53	2.00	.....
Ingersoll-Rand Co	6.00	7.73	6.40	7.87	.....
Interntl. Combust. Engin. Co	1.55	2.67	2.20	2.75	.....
Link-Belt Co	†3.54	†4.17	†3.10	†4.21	4.50
National Acme Co	1.15	0.38	0.39	2.41	4.00
North West Engineering Co	†4.52	†4.62	†5.12	†4.64	4.50
Oil Well Supply Co	3.69	4.80	0.07	d–0.57	.....
Torrington Co. (of Maine)	†2.86	†3.32	†3.92	†5.73	.....
United Shoe Mach. Co	*3.18	*3.16	3.36	3.33	3.30
American Mach. and Foundry	*1.81	3.81	7.11	6.56	10.00
American Type Founders Co	17.88	17.69	9.88	14.24	15.00
Chicago Pneumatic Tool Co	*0.28	*2.95	*2.87	*3.26	4.50
Evans Auto Loading Co	*2.22	*2.41	*3.08	*3.67	4.00
R. H. Hoe and Co	0.05	5.95	d–1.72	d–0.83	4.00
Intertype Corporation	*3.56	*1.88	*1.82	*2.48	3.00
Marion Steam Shovel	5–4.05	5–4.34	2.21	1.57	3.50
Mergenthaler Linotype Co	*10.55	10.25	7.04	7.44	8.00
National Supply Co	5.71	15.19	8.59	9.59	10.00
Seagrave Corporation	2.49	2.17	1.74	2.21	1.50
U. S. Hoffman Mach. Corporation	5.72	6.04	5.38	4.29	3.29
Worthington Pump and Mach. Corp	d–3.79	d–5.04	d–3.23	d–0.29	10.00

Notes

*Adjusted earnings; †Indicated earnings; d Deficit; 1–Before Federal taxes; 2–After extraordinary charges; 3–Thirteen months' report; 4–After participation; 5–Predecessor companies.

* * *

Foundrymen Choose Nominating Committee

The 1930 nominating committee of the American Foundrymen's Assocation was completed recently with the election of four members by a letter ballot. Election judges who canvassed the votes declared the following members elected to the committee: M. J. Evans, vice-president of the Whiting Corporation, Harvey, Ill.; R. J. Doty, plant manager, Reading Steel Casting Co., Reading, Pa.; Wm. J. Grode, president, Liberty Foundry, Inc., Milwaukee, Wis.; and T. H. Addie, president, American Manganese Bronze Co., Philadelphia. In addition to these four members elected annually, the last three living past presidents of the organization will serve. They are A. B. Root, Jr., Hunt-Spiller Manufacturing Corporation, Boston, Mass., senior past president and chairman of the committee; S. W. Utley, Detroit Steel Casting Co., Detroit; and S. T. Johnston, S. Obermayer Co., Chicago. A meeting of the committee will be held shortly after the first of the year.

* * *

Prizes Offered by Milburn For City Gas Cutting

The Alexander Milburn Co., Baltimore, Md., is offering three prizes of $1,000 each for the years 1930, 1931, and 1932 to further the development of apparatus for systems using illuminating or by-product gases for general welding and cutting purposes instead of the more expensive manufactured gases now in use. The prizes are offered for the best authenticated results accomplished with illuminating or city gases tending to lower the cost of the present methods. Particulars regarding the methods of determining the awards will be furnished upon application to The Alexander Milburn Co., 1416-28 W. Baltimore St., Baltimore, Maryland.

* * *

Stanley Tool Acquires Ajax Hammer Corporation

The Stanley Electric Tool Co., subsidiary of The Stanley Works, New Britain, Conn., has purchased the trade name, stock on hand, tools, jigs, fixtures, and business of the Ajax Hammer Corporation, 117 West 63rd St., New York City, and will continue manufacture and development at the main plant at New Britain, Conn. Distribution of the line of electric hammers will continue through regular jobbing channels. Inquiries regarding service should be addressed to the Stanley Electric Tool Co., New Britain, Connecticut.

* * *

Henry & Wright Company Changes Hands

A controlling interest in the Henry & Wright Manufacturing Co., Hartford, Conn., has been purchased by executives connected with Stone & Webster, Inc., Boston, Mass., according to a recent announcement. At a meeting held in Boston on Nov. 14, the following officers were elected: C. J. Sorrells, chairman of the board; J. F. Funk, president; W. J. Henry, vice-president; F. H. Farnham, treasurer; and D. C. Jewett, secretary. Directors are: Richard Harte, W. J. Hopkins, H. G. Philbrook, W. A. Ready, and W. J. Henry.

* * *

Yale & Towne Buys Vaughan

The Yale & Towne Manufacturing Co., Stamford, Conn., will acquire H. T. Vaughan, Ltd., of England, by an exchange of 19,400 shares of Yale & Towne stock. The Vaughan company employs 900, and is the eighth Yale & Towne foreign subsidiary.

BUSINESS BAROMETER

Assurances of industrial and commercial leaders to President Hoover point the way to better business conditions

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

AS A sedative, Dr. Hoover's prescription seems to have taken effect. The stock market has quieted down. Values have recovered a small part of the sensational decline they recently sustained. Many captains of industry, including the railway officials, have announced that they will not curtail the improvements or construction work that had been planned for the near future. Officials of many towns and cities, as well as of some state governments, have made similar announcements, and employment seems to be assured for everyone who is willing to work during the coming winter. Henry Ford has stated that he will raise the pay scales in his plants, and other manufacturers have assured the President that the wages of their workers will not be cut. If business enterprise generally can be induced to follow the leadership thus set, it is altogether probable that the normal and hitherto inescapable effects of a stock market panic may be escaped, and that another upward movement may be under way much earlier than is now expected by most commentators.

This possibility has revived the hopes of many speculators, and encouraged some fresh buying by those who have any disengaged capital left. Those who are willing or able to buy on margin are not as numerous as they were, and one reassuring fact about any advance in securities that may take place in the near future is that it will be the result of investment rather than of marginal buying. Meantime, the business men of America are asking themselves whether hot-house products can ever be as good as those that are grown under natural conditions. If to this question an affirmative answer be made, then it may be taken for granted that President Hoover has found a way to keep the ship of commerce on an even keel despite the vicissitudes of the weather, and that those who maintain that the era of the business cycle has passed are correct. But we must wait upon time and the event for a final answer to the question.

Meanwhile, it is worth observing that the low range of commodity prices and the efforts that the Farm Board is making to sustain agricultural values are attracting more or less attention to the speculative staples. Most of them were steady, if not higher, last week. Cotton appears to have become immune to bearish influences. The latest ginning report confirms crop estimates of fifteen million bales, and the resiliency of the market in the face of a supply that is sufficient, if not excessive, is remarkable. Silk is at the lowest prices registered for many years. Coffee may go lower. Rubber is below the presumptive cost of production and hides have had a prolonged decline.

Much is being made of the reduction in the output of automobiles, which is the chief and almost the only cause of the decline in iron and steel production. But these recessions have been long foreseen and they would not be considered especially depressing now if the stock collapse had not caused such a psychic shock.

The most serious feature of the situation is the decrease in new building construction, which some authorities estimate at 25 per cent lower for October, as compared with the same month in 1928. This is the natural and inevitable effect of high money but with cheaper money and a better bond market, it should soon be practicable to finance all the new building that may be necessary or desirable.

Therefore, the outlook is reasonably satisfactory, and while the repercussions of the recent panic are still to be heard as a small failure is announced here or there, no serious unsettlement appears to have been created, and confidence is rapidly recovering from the shock that was given it by the decline on the Stock Exchange.

Certainly things are in a very much better position than they were four weeks ago. In that time brokers' loans in New York have been reduced more than three billion dollars, which probably signifies a reduction of more than double that amount in the country's total loans upon securities. If this continues, even at the greatly reduced speed that is to be expected, Wall Street ought to be in a position to encourage a sound revival in business.

The news from abroad is also reassuring. The shock caused by the Hatry failures in London seems to have passed, and no additional weakness has been developed by the strain put upon Great Britain's financial machinery. The prosperity of France and Germany is becoming more and more obvious as the winter approaches, and if the present British Ministry can find a way to put England back on her feet industrially, a world-wide revival in business ought to be seen and should include the United States as well as Canada.

The important thing for Americans to realize is that they have not been hurt by the recent mark-down in the paper value of their securities. We can and will continue to grow richer if the consumers who will pay a fair price for our rapidly increasing production can be found. The problem is, first, to find the consumer, and second, to persuade him to supply his legitimate wants by the purchase of American products.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

STABLE conditions exist in most machinery and machine-tool markets of the country. Demand is holding steady, with here and there a slight seasonal dropping off. The month is running true to form, in the opinion of dealers, and little change is expected before the first of the year. Prices are unchanged, and deliveries are getting better. The used-tool market is slow.

NEW YORK business for the week was largely from railroads, as a result of their preparations for 1930. New England demand slowed down somewhat, increased demand from the aeronautical field contrasting with automotive demand falling off. Canadian demand is holding up well, with aircraft companies and railroads showing interest. Most Buffalo industries are in good shape, and there are many buyers in the field. Cincinnati business is expected to improve in the near future. Detroit conditions are a little better than they have been. Indianapolis automotive and radio companies are showing the most interest. Chicago business is spotty, with a goodly volume of inquiries; hacksaws, bandsaws, grinding machines, and portable tools are all in demand.

OPINION is general that conditions will show but little change before the first of the year and the reopening of the larger company budgets.

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THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

The market for new machine tools in the New England territory slowed down somewhat during the current week. But, despite an apparently smaller volume of orders as compared with these of the preceding week, industrial leaders feel that November will be a better month than November of last year from the standpoint of new business placed. The month is running fairly true to form in the opinion of machine-tool builders and dealers.

The buying power of the automotive industry has diminished until it has reached it lowest level of the year. It is the leading contributor to any tapering off in the demand for machine tools. Parts manufacturers have been held up on some orders form this source. Ground lost has been partially made up by an increased demand form the aeronautical field. The latter industry, however, is planning its main buying program for after the first of the year.

CANADA

With basic industrial conditions in Canada still sound, and manufacturing plants working at or near capacity, demand for machinery and machine tools is holding up well. Several good-sized orders have been reported in the electrical field during the last two weeks. Most of these have come from British Columbia where power plant construction is particularly active. Manufacturers of pulp and paper machinery have also been experiencing a steady demand, particularly from the provinces of Quebec and New Brunswick. Aeronautical buying is increasing steadily, and inquiries from the railroads indicate a heavy volume of buying in the early part of next year. The first of a new series of 10 heavy passenger locomotives has just been delivered to the Canadian Pacific Railway by the Montreal Locomotive Works.

While there has been some recession in the iron and steel industry, conditions are still very good for this time of the year, and most plants are well employed. The new 18-inch merchant mill under construction at the Algoma Steel Corporation's plant will be ready to operate by Dec. 15, and the new 12-inch mill will be ready by Jan. 1. The principal car companies are still very busy. The Canadian Car and Foundry Co. reports sufficient volume of business on hand to keep the plants active during the balance of the present calendar year. The National Steel Car Corporation also has sufficient orders to keep its plants busy until well into next year, with further substantial contracts in prospect. Little improvement is reported in the automotive industry.

BUFFALO

Up to the present time, the financial orgy has had no visible effect upon industrial conditions in this district. Most industries are in reasonably good shape. Orders continue to be small, but they also continue to come from a wide variety of industries. There are many buyers in the field, and inquiries continue to be fairly good in volume.

There has been much interest in the announced merger of Donner Steel Company of Buffalo with Witherow, and it is expected that there will be more improvements at the Donner plant in the way of mechanical equipment as a result of this move. Donner has, however, been raised to a rather high degree of efficiency during the last three years by large plant expenditures. It is making an extensive line of steel alloys, and this is likely to be augmented as a result of the merger.

Improvements continue at Bethlehem. This company is improving its producing equipment. Minor steel companies are active. Demand for electrical equipment is keeping pace with that for machine tools in a wide variety of fields. Demand for contracting equipment is slight. It is off season for road equipment, although some snow-removal machinery may be in demand next month. Most of the winter construction projects here are well under way.

CINCINNATI

Machine-tool manufacturers of the Cincinnati district report that demand is holding steady, with very little change from the previous week. The market is showing signs of taking on a better tone, and there is a general feeling that soon sales will be back to the level at which they were.

In the past week, the market feature continued to be the purchases made by miscellaneous small users whose requirements were largely confined to single tools and replacements. The orders were well scattered geographically and the requirements of the buyers were well diversified. However, there were quite a numbr of orders for two tools and there were some for three or more.

Selling agents reported that they did a little better than to hold their own in the past week. A good amount of business is pending. In local and adjacent territory, it is pointed out, concerns in the various branches of the metal trades are very busy, and for this reason the demand should return to a higher level.

The week's inquiries were well scattered and well diversified, and because of their number and general tone they are regarded as a good basis for optimism. Orders booked and coming in are sustaining production at a good level. Prompt deliveries are being made, the time required for shipment depending on the type of equipment ordered.

DETROIT

The market for machinery and machine tools has shown a little improvement in the past ten days. Some of the dealers report that sales have remained at the level of the past few weeks and that inquiries have increased to a slight degree.

In general, it is believed here that the automobile industry will not constitute a favorable market for equipment during the balance of 1929. Manufacturers are still waiting for more tangible evidence of renewed buying tendencies on the part of the public before making their production plans. There seems to be a definite feeling on the part of business men and manufacturers that the first of the year will mark the beginning of a forward readjustment.

In spite of the present lull, machinery manufacturers are still far behind on their orders and some of the dealers here do not expect to be clear before January. One of the encouraging things about the present situation is that there have been relatively few cancellations.

The general atmosphere in Detroit is more optimistic than it has been for the past few weeks.

NEW YORK

The machinery and machine-tool market in the New York district is marking time. Inquiries and orders are about as they have been for several weeks past. Dealers report business good and inquiries slightly better than normal, but demand continues to be widely scattered and for single items. The market appears but slightly affected, although the usual recession just before the first of the year is beginning to appear. Most companies have exhausted their budgets, and no business, except for replacement, is expected until the new year. The Norfolk & Western list for tools is expected to be closed in the next few weeks. There are no other large lists outstanding at this time. Much of the business of the week was from the Midwest. Railroads are showing some interest in the metals market, partially as a result of President Hoover's conferences, and partially as a result of the usual endeavor to prepare for the new year. The New York Central railroad has entered the market for spikes, bolts, tie plates, and splice joints. Bids are to be opened Nov. 26. Indications are that the requirements for 1930 will be about 5 per cent in excess of this year's requirements. The New York Central will also open bids on 15 locomotives on Nov. 26. Other eastern railroads expected in the market shortly are: Erie; New York, New Haven & Hartford; Lehigh Valley; Central Railroad of New Jersey; an Delaware, Lackawanna & Western. The Pennsylvania Railroad is expected to place a $16,000,000 order for 150 electric locomotives early next year, to be used in the $100,000,000 electrification plan of the railroad. The Chicago & North Western has just let a contract for 68,000 tons of steel rail to cost $5,000,000, and to be delivered early in 1930. The Chicago, Burlington & Quincy has let contract for $8,500,000 of freight and passenger cars and locomotives, and also for $2,000,000 worth of new rails.

CHICAGO

Representatives of machine-tool builders and dealers in machinery report spotty market conditions. Thus far, November has been a comparatively dull month, though an encouraging feature has been found in a goodly volume of inquiries. Business is spotty, the demand for some lines keeping on a good level, while in others there is a recession. The local representative of one of the leading makers of hack and band saws reports a large increase in sales. He declares that 1929 will be one of the best years in the history of the plant. The demand for grinding machines is being well maintained. Small electrically operated and portable tools are selling on practically as high a level as at any time in the present year. The recession noted of late has been largely in heavy-duty shop equipment, but inquiries for this type of tool are said to be increasing. While market conditions are susceptible to considerable improvement, underlying the disappointment caused by the recent let-up

in buying, there is a feeling of optimism that the close of the year will find the machinery industry again on a satisfactory basis, and that the beginning of 1930 will bring a decided upward trend.

Interviewed by a Chicago newspaper on the business outlook, and the possibilities of curtailed operation as a result of recent stock market conditions, President Herbert F. Perkins of the International Harvester Co. said the corporation he represented had no thought of drawing back, and that he believed they would have a very good year. Similar expressions of confidence in the future were voiced by Charles Piez, chairman of the board of the Link-Belt Co., who stated that stock market conditions had not stopped his company from proceeding with the construction of a new $300,000 plant in San Francisco, or the plans for a new one at Toronto next year. R. T. Crane, president of the Crane Co., said his concern had just had the largest month in its history, and that they were going ahead with their plans for enlarging their manufacturing facilities.

INDIANAPOLIS

In some instances, orders for machinery and machine tools are being held up until after the first of the year. There is a lot of business in sight here at the present time, but, awaiting the trend of general conditions, and buyers are holding off temporarily. Feelers are being put out by the automobile trade. Most of the factories report a fair winter business in prospect and some replacements will be necessary. For example, the Marmon factory here reports unfilled orders now more than 25 per cent greater than they were a year ago.

Inquiries also are being received from the various farm implement factories throughout the state. These factories are getting back into production against a prospective good spring demand and are buying their requirements. The demand is not heavy at the present time, but should increase steadily from now on until late winter.

Demand for all construction machinery has fallen off sharply, but the outlook for next year is reported much brighter than it was a year ago. A bright spot in the business continues to be the radio field. The factories in this section all are working, most of them increasing production.

* * *

Metal Trades Association Formed in New York

Formation of a metal trades association representing the manufacturers of stampings and tool and die makers was entered into on Nov. 20 by eleven member firms located in the Metropolitan District. These concerns were interested in the project by an organization committee consisting of Adolph Hopp, of the Mutual Metal Craft Co., Felix Wyner, of the Wyner Machine Works, and Ernest Furst, of the Eureka Tinware Manufacturing Co. It is expected that more than 50 member firms will be obtained within a short period.

Although it is hoped that the association will in time take on the wide activities of a full-fledged trade organization, for the present its entire attention is to be devoted to the formulation of a standard contract to be used by the industry, and to the dissemination of cost data. It is believed that these two phases of the work, if properly carried out, will do much to alleviate conditions of unfair competition prevailing in some quarters.

After some discussion it was decided to name the organization "Metal Trades Association of New York," because it was felt that the membership need not be limited to manufacturers of stampings, tools, and dies. According to the by-laws adopted, "Any firm, person, or corporation engaged in the manufacture by contract or job order of pressed metal goods, dies, tools, machinery, or kindred lines is eligible for regular membership in this association. The membership is to be confined to the City of New York and the vicinity thereof, comprising the so-called Metropolitan District." The general management and control of the policy, work, funds, and property of the association are vested in a board of nine governors, these governors being elected by the members of the association. Each governor will head a committee for the study of a particular problem. Messrs. Hopp, Wyner, and Furst were elected to the board to carry on the organization work for a term of one year.

The member firms to date consist of: H. K. Lorentzen; Tudor Metal Products Co.; Gustav Danzis Co., Inc.; Wyner Machine Works; Triangle Mechanical Laboratories; Ben-Moore Manufacturing Co.; Century Machine & Tool Works; Selco Tool & Die Co.; Woodhaven Metal Stamping Co.; Du Plus Co.; and the Novelty Wire & Metal Works. Communications with regard to membership should be addressed to Adolph Hopp, 390 Second Ave., New York City.

* * *

Nine Months' Aero Exports Double Total for 1928

American exports of aeronatic equipment for the first nine months of 1929 are more than double the value of those for the entire year of 1928. During the first nine months of 1929, there were 275 aircraft exported with a valuation of $4,397,311, as compared with 162 airplanes exported, valued at $1,759,653 for the whole year of 1928—the peak year for exports of this item. Last year, less than 4 per cent of the aircraft production was exported. It is expected by the end of this year that the ratio of exports to production will have been doubled. These facts are brought out in a study by Leighton W. Rogers, chief of the Aeronautics Trade Division of the U. S. Bureau of Commerce.

The unprecedented increase in exports of aeronautic products dating from the first of the present year may be attributed in part to the extension of United States airlines into Latin America and the West Indies, according to the study. These lines will expedite international trade in those sections. Twelve Latin American countries were included among the 23 countries which purchased our aircraft during the first nine months of 1929, and 59 per cent of all exports of complete aircraft went to Cuba, Central America, and South America. Canada, which was the leading market in 1928, was led by Mexico and Chile in the valuation of complete airplanes purchased during the first nine months. This may be explained in part by the increased activity in assembling United States aircraft in Canadian factories. China, which has only recently opened as a market, purchased 19 airplanes during the first three quarters of the year as compared with nine for the whole of 1928.

Forty-three countries purchased parts during the first nine months of the year. These miscellaneous items of aeronautic equipment went to 20 more countries than did complete aircraft which may mean that these part shipments will pioneer the way for sales of the complete units.

* * *

National Founders Hold 33rd Annual Meeting

Under the chairmanship and presidency of Thomas Hammond, Whiting Corporation, Harvey, Ill., the 33rd annual convention of the National Founders Association convened at the Hotel Astor, New York, Nov. 20 and 21. Registered member attendance was more than 150, not including guests. During the morning session the convention heard a joint report of the officers, presented by Mr. Hammond, reports of various committees, and an address on "The Legislative Situation" by Walter Gordon Merritt, associate counsel, League for Industrial Rights.

At the Wednesday afternoon session, Frank F. Winans, Baker, Winans & Harden, New York City, read a paper on the subject of "Finance." He canvassed the present vogues in industrial financing, analyzing the cause underlying recent stock market fluctuations.

Roland Falkner, chief statistician, National Industrial Conference Board, discussed the vital importance of facts and fact finding in his address on "Business Policies and Business Information." H. M. Lane, consulting foundry engineer of Grosse Ile, Mich., read D. R. Wilson's paper on "Seven Years Foundry Improvement."

The following officers were elected: Thomas S. Hammond, president (president, Whiting Corporation, Harvey, Ill.), S. Wells Utley, vice-president, (vice-president and general manager. The Detroit Steel Casting Company.

* * *

Foundry Equipment Men Report Better Business

The keynote of the Nov. 19 meeting of the Foundry Equipment Manufacturers' Association, held at the Hotel Roosevelt, New York City, was "business even better than normal." Member firms reported net orders for October at an index figure of 240.3, as against a three-months average of 230.3. November orders and inquiries were satisfactory to a good 90 per cent of the members present.

H. W. Standart of the Northern Engineering Works, Detroit, president of the association, was chairman of the meeting.

Foundry Equipment Orders Show 13 Per Cent Increase

October foundry equipment orders were 13 per cent greater than those of the preceding month, according to a report just published by the Foundry Equipment Manufacturer's Association. The index of gross orders for October, 1928, was 185. The 3-month average of gross orders was 230.3, as compared with 218.7 in September and 211 in October, 1928. Shipments were 214.1, as compared with 176.8 in September, and 254.3 in October, 1928. The unfilled orders index was 492.5, as compared with 480.8 for September and 462.6 for October, 1928.

* * *

Steel Founders Elect Officers and Directors

At the recent meeting of the Steel Founders Society of America, J. E. McCauley of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., was elected president. W. H. Warrilow, chairman of the eastern division, was elected a vice-president. John E. Galvin, Arthur Simonson, and E. H. Cornelius, chairmen of the central, midwest-southern, and mid-continent divisions respectively were elected vice-presidents also. The board of directors of the organization was elected at the meeting.

Business Items

Fairmont Railway Motors, Inc., with headquarters in Fairmont, Minn., has organized a Canadian company, under Dominion charter, to be known as Fairmont Railway Motors, Ltd. The company will manufacture its cars at the plant of the Dodge Manufacturing Co., Ltd., Toronto, and will have on its board of directors, T. A. McAuley, president, and M. H. C. Anderson, general manager of the Dodge Manufacturing Co., Limited.

Danly Machine Specialties, Inc., Chicago, has opened a warehouse and assembly plant at 1444 E. 49th St., Cleveland, Ohio, in charge of J. R. Fitzsimmons.

The Cleveland office of William K. Stamets, machine-tool dealer, will be located at 462-464 Rockefeller Bldg. George D. Miller is district manager.

The Springfield Bronze Co., Springfield, Mass., has changed its name to the Springfield Bronze & Aluminum Company.

William K. Stamets, Rockefeller Bldg., Cleveland, has been appointed sales representative in the northern Ohio territory for Andrew C. Campbell, Inc., manfacturer of nibbling machines.

Equipment is being installed and transferred to the new steel finishing plant of the Walworth Co., Kewanee, (Ill.) plant, and production is scheduled to be started in the structure before the end of December. J. E. Kemp, superintendent of construction, had charge of the building of the 280x70-ft. factory addition.

Personals

W. H. Langlas, George Huntley, and Art Young have been elected directors of the newly formed Royer Manufacturing Co., Waterloo, Iowa. L. A. Kleibenstein is secretary and sales manager.

John M. Rogers, formerly of the Wright Aeronautical factory, has been appointed Western representative of the Wright Aeronautical Corporation, with headquarters in Los Angeles.

F. W. Forward, 520 West Blvd., Elkhart, Ind., has been appointed representative of the Chicago Pump Co., Chicago, Ill., for his territory.

Norman T. Bolles, Newark, N. J., has been elected president of the Indian Motorcycle Co., Springfield, Mass., to succeed J. Russell Wait. Mr. Bolles, a graduate of the engineering department of the University of Michigan, entered the board of directors at a reorganization this month.

A. L. Hiles has been appointed general manager of the Vancouver Engineering Works, Vancouver, B. C. Mr. Hiles succeeds Eric Davies, who will remain with the firm as treasurer, and will also retain his seat as chairman of the board of directors.

Gen. Manual Quinones and Capt. Benjamin Mendez of Colombia, will visit the United States in the near future to inspect American aviation factories and equipment.

Frank P. Walsh has been appointed manager of the St. Louis office of the Whiting Corporation, Harvey, Ill. His headquarters will be at 1442 Syndicate Trust Bldg., St. Louis, and his territory will comprise southern Illinois, a large part of Missouri, Arkansas, Oklahoma, western Iowa, and Nebraska. He has been at the main office in the estimating and sales departments for the past 14 years.

Obituaries

David Van Schaack, director of the Bureau of Inspection and Accident Prevention, of the Aetna Life Insurance Co., died suddenly of heart disease on Nov. 13, 1929, in his sixty-first year. Mr. Van Schaack was a pioneer in the safety movement. He was one of the committee which organized the National Safety Council, and later served twice as its president.

Thomas A. Carroll, advertising manager of E. C. Atkins & Co., Indianapolis, Ind., for the past 16 years, died suddenly on Nov. 18, of a blood clot on the brain. He was born in Beaver Falls, Pa., 51 years ago, and lived there, working for Emerson, Smith & Co., until he joined the Atkins Company in 1913.

Herman Hollerith, 69, inventor of an electric tabulating machine used by the U. S. and foreign governments, died on Nov. 17 at his home in Washington, D. C. He was a charter member of the A.S.M.E. and had received the gold medal of the Franklin Institute of Philadelphia.

Chas. B. Moore, chairman of the board of directors of the Oxweld Railroad Service Co., and president of the Ajax Burke Co., Chicago, and vice-president of the Youngstown Steel Door Co., Cleveland, Ohio, died on Nov. 9 at Chicago, Ill.

Chas. A. Hood, 60, manager of the Buffalo Tool & Supply Co., died at his home in that city recently. He had been associated with the company for the past 30 years.

George M. Bassett, 65, managing director of Johnson & Bassett, died at his home in Worcester, Mass., on Nov. 14. He was a graduate of Amherst college in 1886.

Frederick L. Beers, editor of *Power* for 40 years, died on Nov. 13 at the age of 70 in Bridgeport, Conn., after a short illness. He had retired in July.

John Koenig, founder of the Aluminum Goods Manufacturing Co., Manitowoc, Wis., died at Manitowoc on Nov. 15.

Forthcoming Meetings

American Society of Mechanical Engineers — Annual meeting, New York, Dec. 2 to 6. Headquarters will be at 29 W. 39th St., New York City. Calvin W. Rice is secretary.

Power Transmission Association—Annual Meeting, Hotel Commodore, New York City, Wed., Dec. 4, 10 A.M. through luncheon. W. S. Hays, 644 Drexel Bldg., Philadelphia, Pa., is secretary.

Taylor Society — Open meeting, Dec. 4, 5, and 6. Hotel Pennsylvania, 7th Ave. and 33rd St., New York City. The society offices are at 29 West 39th St., New York City.

Steel Founders' Society of America—Regular meeting, Pittsburgh, Pa., Dec. 12. Details may be obtained from the Executive offices, 932 Graybar Bldg., New York City.

American Engineering Council—Annual Meeting, Washington, D. C., Jan. 9 to 11. L. W. Wallace, 26 Jackson Place, Washington, is secretary.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

THE trend in prices of non-ferrous shop materials has been downward for the last three weeks. This week, however, cold-drawn steel dropped 10c. per 100 lb. at New York warehouses, marking the first break in steel since the decline started. Tin, lead, solder, scrap non-ferrous metals, abrasives, and linseed oil moved to lower levels, compared with those of Nov. 15. The recession in steel buying is largely seasonal with the exception of automotive requirements, which have been particularly small since the stock-market crash. Structural steel shops, on the other hand, have a volume of orders booked, considered unusually large for so near the beginning of winter.

(All prices as of Nov. 22, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00@14.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.26@21.76
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.55	3.85	3.70	3.80
No. 22	2.70	4.00	3.85	3.95
No. 24	2.75	4.05	3.90	4.00
No. 26	2.85	4.15	4.00	4.10
No. 28	3.00	4.75	4.15	4.25
Galvanized				
No. 10	2.80	4.20	4.05	4.05
Nos. 12 to 14	2.90	4.30	4.15	4.15
No. 16	3.00	4.40	4.25	4.25
No. 18	3.15	4.55	4.40	4.40
No. 20	3.30	4.70	4.60	4.55
No. 22	3.35	4.75	4.65	4.60
No. 24	3.50	4.90	4.75	4.75
No. 26	3.75	5.15	5.00	5.00
No. 28	4.00	5.40	5.25	5.25

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follow[s]:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
¾	.58½	2.875	2.469	.203
1	.76½	3.5	3.068	.216
1¼	.92	4.0	3.548	.226
1½	1.09	4.5	4.026	.237
2	1.48	5.563	5.047	.258
2½	1.92	6.625	6.065	.28
3	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal Fractions	B.w.g. and	Outside Diameter in Inches ⅛	¼	⅜	½	¾	1	1¼	1½
		Price per Foot							
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″	12	.22	.24	.26	.27	.28	.30	.32	
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			41.50@42.50
Lead, pigs, E. St. Louis	6.10	New York	7.00@ 7.50
Zinc, slabs, E. St. Louis	6.20	New York	7.50@ 8.00

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, mill, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.75@11.25	12.25	10.11
Solder (½ and ½).....	29.75	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			56.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper.....	14.50 @15.00	13.50	12.00 @12.50
Copper, heavy, and wire..	13.50 @13.75	13.00	11.00 @12.00
Copper, light, and bottoms	12.00 @12.25	12.50	10.00 @11.00
Heavy lead.....	4.37½@ 4.87½	6.25	4.25 @ 4.75
Tea lead.....	2.87½@ 3.12½	4.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.00 @ 7.50
Brass, heavy, red.....	11.00 @11.50	12.50	10.00 @10.50
Brass, light.....	6.25 @ 6.75	7.50	6.00 @ 6.50
No. 1 yellow rod turnings.	9.00 @ 9.50	9.00	7.50 @ 8.00
Zinc.....	2.75 @ 3.00	3.25	2.50 @ 3.00

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.152	.164	.16
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.035	.036	.034
Brass rods.....	per lb..	.2125	.2125	.1825
Solder (½ and ½).....	per lb..	.2975	.31	.3575
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.60	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$5.94	$5.94
Emery cloth*.....	25.87	26.40	26.40
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.65@2.75		
Coke, prompt foundry, per net ton.....	Connellsville, 3.50@4.85		
White lead, dry.....	100 lb. kegs ...	New York, 13.75	
White lead, in oil.....	100 lb. kegs....	New York, 14.25	
Red lead, dry.....	100 lb. kegs....	New York, 13.75	
Red lead, in oil.....	100 lb. kegs....	New York, 15.25	

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mich., Detroit—Dept. of Purchases & Supplies, 735 Randolph St., J. E. Mills, Comr. will receive bids until Nov. 29 for one Lincoln stable arc electric welder, model S-1932-A or equal.

Mich., Detroit—Otwell Co., 17055 Fullerton Ave.—drill press and grinder.

Pa., Ambridge—A. M. Byers Co., 1603 Clark Bldg., Pittsburgh, J. E. Stauffer, Purch. Agt.—machinery and equipment for proposed new plant here.

Pa., Etna — Spang Chalfant & Co., 2317 Clark Bldg., Pittsburgh, J. A. Herman, Gen. Purch. Agt.—new pipe handling machinery, etc. for proposed improvements to pipe mill here.

Pa., McKeesport — Columbia Radiator Co., 3200 Walnut St. F. T. Nason, Pres., machinery and equipment for proposed 1 story, 100 x 200 ft. foundry, machine shop and warehouse.

Pa., McKeesport — National Tube Co., Frick Bldg., Pittsburgh, G. G. Goe, Purch. Agt.—purchasing equipment for tube plant to consist of two seamless tube mills, one open hearth and one bar mill. Total estimated cost $20,000,000.

Opportunities for Future Business

Calif., Berkeley—Byron Jackson Pump Co., 55 New Montgomery St., San Francisco, awarded contract for a 1 story factory on Carlton St. here. Estimated cost $25,000.

Calif., Oakland—City, F. C. Merritt, Clk. will receive bids until Dec. 5 for the construction of machine and paint shops, etc. on 5th Ave. Estimated cost $75,000. Noted Nov. 14.

Calif., San Francisco—Pacific Electric Mfg. Co., 5815 3rd St., is having plans prepared for the construction of shops at Carroll and Jennings Sts. Estimated cost $45,000. R. E. McLane, 5815 3rd St., Engr.

Calif., San Francisco—Supt. of Lighthouses, plans the construction of a 3 story warehouse and shop building at Goat Island Lighthouse Depot, Goat Island, San Francisco Bay.

Colo., Pueblo — Fleetcraft Airplane Corp., Lincoln, Neb., will not construct airplane factory here. Project abandoned. Noted Oct. 31.

Conn., Meriden—International Silver Co., 48 State St., awarded contract for the construction of a 2 story factory. Noted Nov. 14.

Conn., Middletown—Wilcox Crittendon & Co., awarded contract for excavation for new foundry building. Lockwood Greene Engineers, Inc., 100 East 42nd St., New York, Engrs.

Conn., Milford—Continental Airports Inc., Roger Sherman Bldg., New Haven, is having plans prepared for the construction of an airport including hangars, shops, etc. Estimated cost to exceed $150,000. H. E. Baldwin, 70 College St., New Haven, Archt. Wynne & Hahn, 902 Chapel St., New Haven, Engr. Noted Oct. 31.

Conn., Norwich—Beit Bros., 252 Main St., is having plans prepared for a 1 story, 100 x 200 ft. garage on West Main St. Estimated cost $50,000. Chandler & Palmer, Thayer Bldg., Archts.

Conn., Waterbury—Platt Bros. & Co., Platts Mills, awarded contract for a 1 story, 75 x 140 ft. brass rolling mill. Estimated cost $42,000.

D. C., Washington—Washington Air Terminals Corp., is having plans prepared for the construction of an aeroplane hangar and shop at Washington Airport. Lockwood Greene Engineers, Inc., 100 East 42nd St., New York, Engrs.

Ga., Columbus—Lummus Cotton Gin Co., F. E. Lummus, Gen. Mgr., is receiving bids for a 1 story, 51 x 202 ft. addition to sheet metal shop. C. F. Hickman, Swift-Kyle Bldg., Archt.

Ill., Joliet—Illinois Steel Co., has work under way on the construction of a sintering plant to reclaim particles of iron from flue dust. Estimated cost $300,000.

Ill., Peoria—Peoria Casket Co., 211 Hamilton St., awarded contract for a 2 story addition to factory. Estimated cost $70,000.

Ind., Auburn—Auburn Auto Co., awarded contract for a 2 story, 22 x 175 ft. factory. Estimated cost $75,000.

Ind., Connersville — Corman-Aircraft Co., awarded contract for the construction of an airplane factory and power plant. Estimated cost $150,000. Noted Nov. 21.

Ind., South Bend — South Bend Tool Co., awarded contract for the construction of a 35 x 85 ft. factory at 1918 South Main St. Estimated cost $47,000.

Mass., Boston—T. L. Darcy, 78 Fisher Ave., Roxbury, awarded contract for a 1 story auto repair shop at 1322 Columbus Ave.

Mass., Boston — Schoolhouse Dept., is receiving new bids for the construction of a 2 story, 65 x 140 ft. school including shops, etc. Estimated cost $250,000. J. M. Gray, 175 High St., Archt. Noted Aug. 1.

Mass., Everett (Boston P.O.)—Warren Foundry & Pipe Co., L. Packett, will receive bids in spring on superstructure of a foundry and warehouse on Elvin St. Estimated cost to exceed $40,000. French & Hubbard, 210 South St., Boston, Archts.

Mass., Haverhill—Owner, c/o C. V. Badger, 191 Merrimac St., is having plans prepared for the construction of three 1 story garages and repair shops.

Mass., Lynn—M. Young, 760 Western Ave., will build a 1 story garage and repair shop. Estimated cost $40,000. G. A. Cornet, 7 Munroe St., Archt. Noted Sept. 19.

Mass., Medford—Somerville Auto Body Co., 643 Broadway, Somerville, is receiving bids for the construction of a 1 story, 75 x 100 ft. auto repair shop at 646 Boston Ave. here. Estimated cost $40,000. F. Dreyer, 10 Temple St., Somerville, Archt. Noted Nov. 14.

Mass., Roxbury (Boston P. O.)—S. Lewis, 32 Linwood St., plans a 1 story garage and repair shop. H. R. Duffie, 364 Broadway, West Roxbury, Archt.

Mich., Detroit—C. W. Ditchy, 415 Brainard St., Archt., is receiving bids for a 1 story, 180 x 200 ft. drill factory on Davison Ave. for American Twist Drill Co., 2804 West Jefferson Ave. Estimated cost $100,000. Noted Oct. 17.

Mich., Detroit—Kelsey Wheel Co., 3600 Military Ave., awarded contract for a 1 story, 135 x 320 ft. addition to wheel plant. $100,000. Noted Nov. 7.

Mich., Owosso — American Malleable Co., Michigan Ave., had plans prepared for the construction of a 1 story, 75 x 80 ft. warehouse for foundry products, on Shiawosse St. Estimated cost $50,000. Private plans.

N. J., Belleville—Wallace & Tiernan Co. Inc., 11 Mill St., manufacturers of chlorine control apparatus, plans addition to factory on Mill St. Estimated cost $40,000. Architect not selected.

N. J., Newark—Fischer Baking Co., 242 Livingston Ave., awarded contract for a 1 story garage and shipping building at 272-280 Belmont Ave. Estimated cost $150,000.

N. J., Newark—Westinghouse Electric & Mfg. Co., 17 Academy St., is having plans prepared for a 2 story factory at State Highway 24 and Haynes Ave. Estimated cost $150,000. B. S. Prack, 119 Federal St., Pittsburgh, Archt. J. H. and W. C. Ely, 605 Broad St., Conc. Archts. Noted Oct. 31.

N. J., Newark—M. A. Wolf, 845 Broad St., Archt., will receive bids about Feb. 1, 1930 for the construction of a 3 story, 160 x 200 ft. garage on South St. for Vogt Bros., Inc., 19 Frelinghuysen Ave. Estimated cost $150,000. Noted Oct. 3.

N. J., North Hackensack—C. V. R. Bogert, 210 Main St., Archt., will receive bids about Dec. 1 for a 1 story workshop and warehouse at Hackensack Ave. and Temple St. for Hackensack Water Co., Main St., Hackensack. Estimated cost $40,000.

N. Y., Astoria—R. Capone, Ditmars Blvd., had plans prepared for an 82 x 188 ft. garage at Steinway St. and 23rd Ave. Estimated cost $40,000.

N. Y., Boroklyn—J. Cervonsky, c/o M. Klein, 65 Court St., Archt., plans the construction of a 176 x 200 ft. garage and factory at Hayward St. and Harrison Ave. Estimated cost $100,000.

N. Y., Brooklyn—P. Hitlin, 16 Court St., will receive bids after Dec. 1 for the construction of a 9 story garage and storage building at Orange and Fulton Sts. Estimated cost $200,000. Slee & Bryson, 160 Montague St., Archts.

N. Y., Buffalo—Sterling Engine Co., 1250 Magara St., awarded contract for a 65 x 120 ft. addition to present shops. Kidd & Kidd, 524 Franklin St., Archts.

N. Y., Long Island City—Scott Welded Products Co., Van Alst Ave. and Harris St., awarded general contract for the construction of a welding shop.

N. Y., Newark—Dept. of Mental Hygiene, Albany, will receive bids until Dec. 11 for the construction of a shop building at Newark State Hospital here.

N. Y., New York—J. A. Waterman, Jr., 640 East Fordham Rd., is having sketches made for the construction of a garage, etc. at Fordham Rd. and Bathgate Ave. Estimated cost $50,000. Architect not announced.

N. Y., Queens—Dept. of Mental Hygiene, Albany, will receiive bids until Dec. 11 for the construction of a shop, etc. at Brooklyn State Hospital, Creedmoor Division here.

N. Y., Richmond Hill—Metz Bros., 129th St. and Metropolitan Ave., plans the construction of a 112 x 240 ft. garage, etc. Estimated cost to exceed $40,000. W. Doyle, 11 John St., New York, Archt.

N. Y., Wading River—Little House of Providence for Homeless Colored Children, 27 Clover Pl., awarded contract for the construction of a garage, etc. Estimated cost $50,000.

O., Cleveland—Lakewood Auto Co., H. H. Heeman, Pres., 16009 Detroit Ave., awarded contract for a 1 story, 139 x 143 ft. auto sales and service building at 11636 Lake Ave. Estimated cost $150,000.

O., Toledo—Electric Auto Lite Co., Champlain and Mulberry Sts., awarded contract for a 1 story, 200 x 625 ft. factory. Estimated cost $1,000,000.

Pennsylvania—Rustless Iron Corp. of America, B. T. Brooks, Secy., 122 East 42nd St., New York, N. Y., is having preliminary plans prepared for the construction of a factory in western Pennsylvania or eastern Ohio. Perin & Marshall, 11 West 42nd St., New York, N. Y., Archts. Noted Nov. 7.

Pa., Donora—American Steel & Wire Co., Frick Bldg., Pittsburgh, awarded contract for new stock house at blast furnaces, new lorry cars and new coke screening equipment. Structural steel let. $1,000,000. Also letting contracts for immediate construction of one continuous bar or billet mill at steel works, and two double line, 18 strand, continuous rod mills at wire works, electrically driven here. $5,000,000.

Pa., Philadelphia—Colonial Holding Co., c/o Colonial Trust Co., 20 North 15th St., plans the construction of a 6 story garage at 12th and Filbert Sts. Estimated cost $500,000. R. C. Bencker, 1601 Chestnut St., Archt.

Pa., Pittsburgh—S. Danovitz, c/o J. F. McWilliams, 6200 Pennsylvania Ave., Archt., will soon award contract for a 1 story, 90 x 130 ft. garage at 750 Shore St. Estimated cost $40,000.

Pa., Pittsburgh—Firestone Tire & Rubber Co., 1286 South Main St., Akron, O., is receiving bids for the construction of a 3 story sales and service building at Baum Blvd. here. Estimated cost $250,000. Lockwood Greene Co., East 14th St. and Euclid Ave., Cleveland, O., Archts. Noted Oct. 24.

Pa., Pittsburgh — Jones & Laughlin Steel Corp., Ross St., plans the construction of a converter building at Monongahela River Bank between 25th and 26th Sts. Estimated cost $50,000. Private plans.

Tex., Corpus Christi—Border Foundry & Machinery Co., c/o R. R. Chamberlain, plans the construction of a shipway for drawing boats out of water for repair. Blucher Engineering Co., Engr.

Utah, Salt Lake City—W. C. Kreplin and O. H. Delzell, awarded contract for the construction of a 4 story, 121 x 150 ft. garage. Estimated cost $200,000. Noted Sept. 5.

Utah, Salt Lake City—Mortuary Service Co., awarded contract for a 1 story, 70 x 120 ft., casket factory. Estimated cost $65,000.

Wis., Kenosha—Kenosha Development Co., will soon award contract for a 2 story, 125 x 164 ft. garage. Lindl-Schutte Inc., 82 East Wisconsin Ave., Milwaukee, Archts.

Wis., Milwaukee—Ignozio Mastopietro, 3036 State St., awarded contract for a 1 story, 150 x 180 ft. garage at 37th and Wisconsin Sts.

Wis., Milwaukee—A. O. Smith Corp., 27th and Keefe Sts., manufacturers of pressed steel, awarded con tact for the construction of a 1 story, 83 x 496 ft. factory on 35th St. Estimated cost $84,000.

Ont., Toronto—G. Rathbone Lumber Co., 10 Northcote Ave., plans the construction of a 3 story addition to woodworking plant. Estimated cost $150,000. V. L. Morgan & Co., 1454 A. Yonge St., Archt.